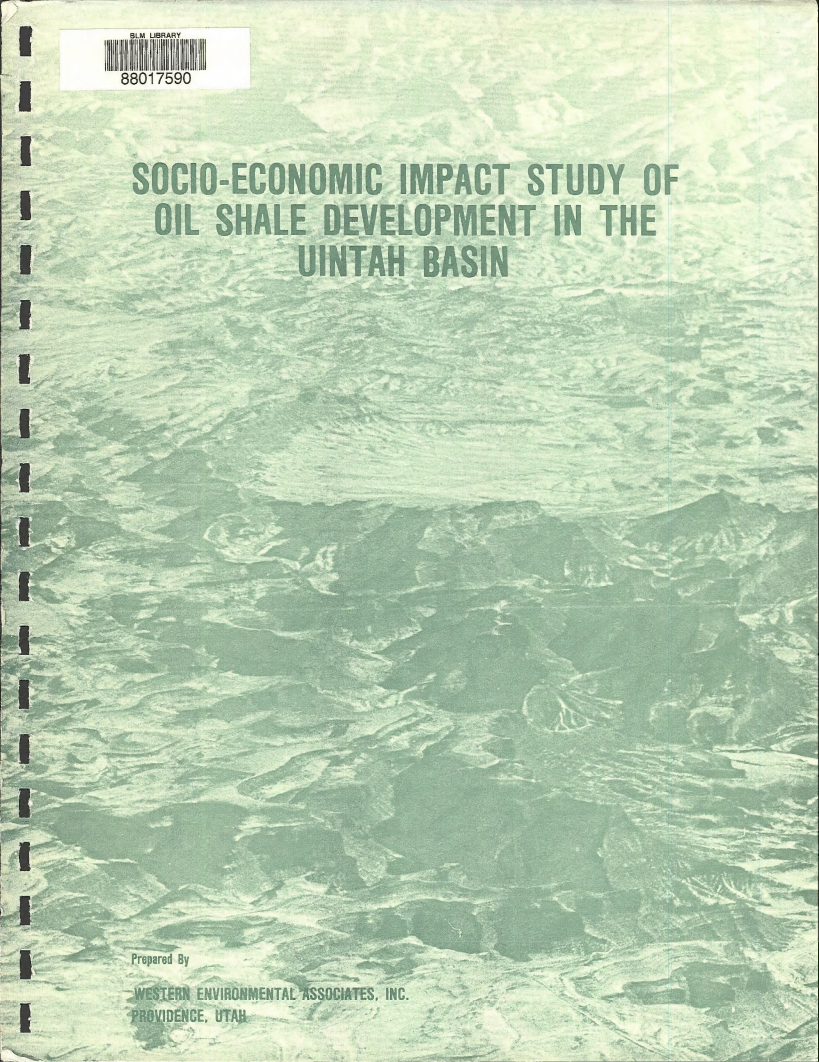
SOCIO-ECONOMIC IMPACT STUDY OF OIL SHALE DEVELOPMENT IN THE UINTAH BASIN



Prepared By

WESTERN ENVIRONMENTAL ASSOCIATES, INC.
PROVIDENCE, UTAH

SOCIO-ECONOMIC IMPACT STUDY OF OIL SHALE DEVELOPMENT IN THE UINTAH BASIN

Phase II of a Two-Phase Impact
Analysis of Proposed Oil Shale Development

prepared for

THE WHITE RIVER SHALE PROJECT
University Club Building, Suite 2150
Salt Lake City, Utah 84111

by

A. Berry Crawford
Herbert H. Fullerton
W. Cris Lewis

of

WESTERN ENVIRONMENTAL ASSOCIATES, INC.
Providence, Utah

November 1975

Jim Liberty
Bldg. 53, Room 1234
Denver Federal Center
P. O. Box 25047
Denver, CO 80225-0047

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

EXECUTIVE SUMMARY

The proposed White River Oil Shale Complex would have significant economic impacts on eastern Utah and part of Western Colorado.[a] A summary of employment, population, and income impacts is outlined in Table 1. The initial employment impact in year (1)[b] is 520 composed of 400 workers in the oil shale complex itself and 120 workers in other sectors. Employment at the complex reaches a peak at 3,500 in year (8); at that time there will also be an impact on other sectors in the region accounting for an increase of 2,450 workers so that the total employment impact is almost 6,000 workers. In Phase II of the commercial stage, when construction activities are essentially complete on a 100,000 barrel per day (bpd) complex, direct employment will be 2,300 and indirect employment, 3,450, for a total employment impact of 5,750. Although employment at the complex itself declines during the latter years of the Phase I commercial stage, that decline ultimately is offset by increases in the number of workers in other sectors in the impacted region.

This employment increase will result in significant increases in the region's population. The baseline or no-project projection shows population increasing modestly to a peak of almost 43,000 in year (4)

[a] The specific impacted region is composed of Duchesne and Uintah counties in Utah and Rio Blanco County, Colorado.

[b] About 1977.

TABLE 1

SUMMARY OF EMPLOYMENT, POPULATION, AND INCOME IMPACTS OF PROPOSED WHITE RIVER SHALE OIL COMPLEX

Year	Cumulative Employment Impact			Population			Income (millions)[a]		
	Direct	Indirect	Total	Baseline Projection	Cumulative Oil Shale Impact	Total	Baseline Projection	Cumulative Oil Shale Impact	Total
Commercial Development Stage									
1	400	120	520	41,063	924	41,987	190.0	17.7	207.7
2	400	120	520	41,686	924	42,610	197.7	18.2	215.9
3	300	120	420	42,310	1,218	43,528	205.8	9.7	215.5
4	300	150	450	42,934	1,305	44,239	214.2	9.4	223.6
Commercial Stage Phase I									
5	1,300	650	1,950	42,636	4,538	47,174	218.2	62.5	280.7
6	1,800	900	2,700	42,338	6,218	48,556	222.3	91.3	313.6
7	2,300	1,380	3,680	42,040	8,277	50,317	226.5	87.6	314.1
8	3,500	2,450	5,950	41,742	13,780	55,522	230.7	179.4	410.1
9	2,500	2,250	4,750	41,444	11,310	52,754	235.0	119.9	354.9
10	2,300	2,300	4,600	41,118	10,930	52,048	239.3	105.6	345.9
Commercial Stage Phase II									
15	2,300	3,450	5,750	39,800	12,535	52,335	263.5	146.6	410.1

[a] Includes proprietors' income (including farms), property income, net transfer payments as well as wages and salaries.

and then declining by year (15) to 39,800. The effect of the proposed action would be to accelerate the population increase in the early years and reverse a downward decline in the later period. The peak population impact is felt in year (8) when the direct and indirect impacts of the proposed action would add 13,780 people to a base population of almost 42,000. In full commercial development (year 15) the total population impact is 12,535, which represents an increase of 31 percent over the baseline projection of 39,800.

Income projections are also reported in Table 1. By year (15) it is projected that the oil shale complex will be generating annual wage income in excess of $48 million with an indirect impact of almost $52 million. Thus, the annual wage income impact associated with development of the complex would be about $100 million at year (15). In addition, there would be substantial increases in income. The total income impact would be $147 million in year (15) which represents an increase of 56 percent over the baseline projection of $264 million.

The impact on demand for land for urban purposes has been projected on a with and without new town basis. Under the assumption that no new town is built, the projected land-use impact for urban purposes ranges from 1,200 to 1,400 acres depending on whether land-use is extensive or intensive. Most of this impact would be felt in the area cities of Rangely, Vernal, and Roosevelt, with a smaller impact on Duchesne. It is projected that the new town would require over 3,500 acres for residential, commercial, industrial, and public services activities. Included in this land allocation is about 560 acres for recreation and open space, an additional 1,000 acres that would be

open space that would be suitable for use for further urban growth, and enough area for an airport and sanitary landfill.

Based on preliminary estimates of water required by the mining, retorting, and the electrical power generating components of the oil shale complex, full capacity operation will require approximately 26,500 acre feet of water per year. This represents an amount equivalent to 3.2 percent of 1965 levels of net depletion requirements for agriculture in the Green River Sub-basin[a] and 6.8 percent of Ute Indian claims on Upper Colorado Basin supplies.

The proposed action will have significant positive implications for the national economy. If production of 100,000 bpd offset an equivalent amount of imported oil, the net impact on the United States balance of trade and payments would be more than $400 million annually at current petroleum prices. Furthermore, because of the nation's increased dependence on foreign supply sources and the possibility of future embargoes on oil shipments to the United States as a result of political or economic differences with other producing countries, additional domestic producing capacity is an important strategic consideration.

Full implementation of the White River Shale complex will result in significant increases in population and purchasing power which, in turn, can be expected to place heavy demands on the existing infrastructure of the study region. At the same time, significant increases

[a]This sub-basin is comprised primarily of Daggett, Duchesne, and Uintah counties in Utah and the western slope of Rio Blanco County, Colorado.

in the tax base and higher personal income will enhance the capacity of various governmental units within the region to expand community infrastructure in both the private and public sectors. In this analysis, projected expenditure impact on urban places and counties within the region were compared with potential revenue impacts. Potential revenues generated by the project exceed estimated expenditure throughout commercial phases I and II. Apparent adequacy of expansions of the tax base in financing increased demands on the public sector must be tempered by recognition that a realistic allocation of revenues is accomplished among governmental units within the study region and from the states to the local region since the two dominant elements in the tax base are the property tax, which will accrue primarily to Uintah County and lease and royalty payments which accrue to the state. Potential questions and problems concerning the intra-regional distribution of revenues among cities and among cities and counties located in different states are not sufficiently well identified or understood at this time. To the extent that inter-local revenue sharing cannot be accomplished successfully, it can be expected to negate the apparent adequacy of the revenue base. Additionally, revenue lag associated with the Commercial Development Stage introduces the questions of availability and source of front end financing.

It is anticipated that the prime source of capital investment funds for financing expansions in community infrastructure will continue to be the nation's bond and stock markets. However, the adequacy of these sources can be influenced positively by increasing the responsibility

of state and federal government and development firms in mitigating higher risks which may be inherent with development of extractive industry in sparsely settled regions. Primary consideration should be directed toward facilitation of market processes for the provision of development capital by such mechanisms as bond guarantees, whether by federal and state government or by the development agencies. However, unilateral assumption of this responsibility by a development firm, such as the White River Shale Project, preempts the responsibilities of federal, state and local governments in devising other realistic mechanisms which facilitate access to traditional market sources of development capital.

Housing demand within the study region has grown more rapidly than supply during the past 5-6 years. Virtually all housing units are being utilized currently and the area is characterized by increasing housing unit prices and rents. Additional increments of housing demand, such as those associated with the shale complex, cannot be introduced into the area without having appreciable impact on the housing market of the area. Total housing demand assignable to the oil shale complex is expected to exceed 4,500 units at its maximum and to level off at approximately 3,900 units with full implementation of Commercial Phase II. The distribution of housing demand will be influenced significantly by the presence or absence of a new town.[a] If the new town

---

[a]No definitive plan for the new town has been made at this point. It will be located in Uintah County and will be a planned development under the direction of one developer or a coordinated group of developers. Under the "no new town" alternative, there would be a variety of different, uncoordinated developments scattered among the primary cities in the area.

is constructed, it could be expected to absorb a major portion of potential housing impact which would otherwise occur in the existing communities. Without the new town, peak demand for additional housing exceeds 1,200 units in Vernal and 1,600 in Rangely, about 64.0 percent of total housing impact. With the new town, combined demand for housing units in these two cities would be reduced to 15.6 percent of the total housing impact.

Although the number of school age children per 1,000 population has declined steadily since the mid-1960s in the study region, recent migration into the area has been of sufficient magnitude to generate significant increases in school age population, which, at some locations, exceeds the capacities of existing facilities and personnel. Thus, development of the oil shale complex and subsequent migration of younger families with children can be expected to introduce an additional increment of school enrollment which exceeds current capacity. Projected enrollment impact is expected to exceed 3,000 students with full development of the project. Approximately 1,800 of these students will be in the elementary schools.

Utilities impacts examined as a part of this analysis include water supply, waste treatment, energy and telephone services. These utilities are examined in terms of projected increase in demand and implied cost of development of new capacity sufficient to maintain current levels of availability in the area. With the possible exceptions of water supply and waste treatment, increases in utilities can be met with "normal" increases in existing facilities. Potential for

realization of scale economies in the construction of water supply and waste treatment facilities will be enhanced with a development pattern which results in increased housing/population density within existing communities rather than a pattern which results in one of lower density. Current plans for expansion of water and waste treatment capacity are considerably in excess of those required by baseline and project related population increases.

Impacts on public safety, health facilities and personnel, and recreation facilities appear to be within manageable limits although short run problems could easily arise because of the "lumpiness" associated with expansion of facilities such as fire stations, hospitals, and recreation.

Eight out of ten residents in the study region generally favor oil shale development. They view this development as stimulating economic growth and yet, not destructive to their preferred rural life style. Residents defined their life style as being not overcrowded, having community solidarity, and has widespread citizen participation which promotes industriousness and independence. Residents generally favor oil shale development even if local taxes rise and if their life style were to be adversely affected.

The Ute Indian Tribe, the largest minority group in the region, has shown an increasing desire to conduct their local government affairs in much the same manner as their majority neighbors. Accordingly, they can expect to be impacted and benefit from oil shale development in a manner similar to the rest of the regional population.

To prepare for this, the Tribal Government is making a concerted attempt to develop a planning capability for insuring that tribal goals and objectives will be achieved in the long term. In this connection, the Business Committee and technical staff have initiated studies to examine how operating and planned energy projects in the Uintah Basin and various possibilities for the utilization of Ute resources (water, land, manpower, and capital) in these developments will affect the achievement of Ute tribal goals.

A gravity model was used to predict the impact of increased population on selected archeological, historical, paleontological, geological, and off-road vehicle sites in the region. It was concluded that the Peletier Ranch and Dry Fork Petroglyphs are the most likely archeological sites to be impacted by oil shale development. The Ignatio Stage Stop is one of several historical sites located nearer the oil shale tracts that could be negatively impacted. The one significant geological site--the Devil's Playground--could be affected if a new town is constructed near the tracts. Finally, off-road vehicle use could cause adverse impacts in the region generally. However, it should be pointed out that these impacts will occur over time in any case; oil shale development merely speeds up the timetable.

1.0 INTRODUCTION

1.1 Nature and Scope of Study

This report constitutes the second part of a two-phase study of the socio-economic impact of oil shale development in the Uintah Basin in East-Central Utah and Northwestern Colorado. The Phase I report contains a description of socio-economic characteristics of the region, and historical and recent trends in those characteristics or indicators. That study also provided a set of baseline projections of population and economic activity that traced the development of the region under an assumption of no oil shale development. The background provided in that document is an essential part of the total assessment.

In this Phase II report, the probable impacts of the proposed shale oil mining and processing complex are identified and measured. Essentially, the predicted impacts indicate the changes in socio-economic patterns and characteristics that will occur as a result of the proposed action during both the construction and operation periods. Specifically, the objectives met in this impact assessment are:

A) Estimation of the economic (income, employment, etc.) and demographic changes that will result from the implementation of the development plans, including those associated with the possible new town development[a] in the area.

B) Economic and demographic changes are related to changes in demand for, and supply of, local governmental services.

---

[a]The new town, if built, will be located in Uintah County, but the location has not yet been determined. It could be built adjacent to, say, Vernal, or it might be constructed nearer the oil shale tracts in the vicinity of Bonanza.

C) An assessment of the potential problems associated with these socio-economic impacts, problems as perceived by people living in the area.

D) Measurement of attitudes of local residents toward the proposed action.

E) Integration and organization of the information generated in a form which is of use to local, state, and national officials in policy making roles.

1.2 Description of Proposed Action

Two basic project development plans are considered herein. Under alternative A, the White River Shale Project would support the development of a commercial shale oil module development in Colorado. Under alternative B, the Project would construct a commercial module demonstration complex in Utah. The ultimate impact under both development scenarios are the same. The key difference is that under alternative B there would be some socio-economic impacts in the early years associated with construction and operation of the demonstration complex in Utah.

1.3 Organization of the Study

The primary impacts on employment, population, and income are outlined in Chapter 2.0.[a] Employment, population, and household multipliers are used to generate projections of indirect employment, population, and number of households. The derivation of these multipliers is outlined in Appendix A of this report. The key indicators, population and employment, under the assumption of full scale development are compared to the baseline of "no project" projections from the Phase I report. The data from Chapter 2.0 are then used to generate detailed impacts on other socio-economic conditions in the following chapters.

In Chapter 3.0, the impact on primary resources is assessed. Specific attention is given to the various land-use impacts that are associated with the expanded population. Detailed projections are made of residential, commercial, industrial, and recreational uses of land. Increased demand for water is also considered.

In Chapter 4.0, impacts on community infrastructure are outlined. Projections are made of the budgets of local governmental units; these data focus on both expenditure increases and the growth path of revenues. An overview is also made of some of the problems associated with the budgeting process. Emphasis is given to the demand on community facilities and services, both in the public and private sector. For example, housing demand, characteristics, and location are detailed. The impact on education, specifically the projections of enrollment and increases in implied demand for

[a] In general, the most critical impacts will be confined to the area including Duchesne and Uintah Counties in Utah and Rio Blanco County, Colorado. These three counties are referred to in the following as the "study region."

educational facilities and services is outlined. The analysis in Chapter 4.0 concentrates on the services provided by the public sector and/or public utility firms. These include water supply, waste treatment, energy, and telephone service. The impact on the provision of public safety services, including fire and police protection, is reviewed as is the impact on health and hospital service delivery systems. In a concluding section, the effect of development on recreational activities and opportunities of the area is reviewed.

The effect of project development on the social and cultural characteristics of the area are examined in Chapter 5.0. A detailed study is made of the attitudes of the local residents toward their communities as they have been and are now, and also their attitudes toward the proposed action. These attitudes were measured in a survey made specifically for this report. Emphasis is also given to the impact on the major minority group in the area, that is, the Ute Indian tribe. The effect on their society, and their role in the economic and cultural development associated with the proposed action is closely examined. In addition, attention is given to a set of social indicators including selected crime rates.

Finally, Chapter 6.0 reviews the impact of oil shale development on the national economy. It is shown that the economic impacts are wholly positive and result in

A) A significant increase in employment opportunities in the Uintah Basin and conceivably in other areas of the country.

B) An improvement in the nation's foreign trade and payments balances; and

C) A reduction in the dependence of the United States on foreign sources of oil which, of course, has important economic as well as strategic implications.

2.0 EMPLOYMENT, POPULATION, AND INCOME IMPACTS

In this chapter the probable impact of the White River Shale Project complex on employment, population, and income in the study area is measured. These data are used as primary input data in the following chapters where their effect on demand for public services (e.g., police and fire protection, education, and waste treatment and disposal), housing and other goods, services, and natural resources are projected. Emphasis is given to both the direct and indirect economic effects of the proposed action.

Two alternative project development plans are under consideration. Under alternative A, the White River Shale Project would support a commercial module demonstration project in Colorado and then proceed to full commercial development in Utah. Alternative B is that the Project would construct a commercial module demonstration project in Utah and then proceed to full commercial development. In terms of economic impact there is one key difference in the alternatives. Under alternative B there would be a significant impact on the study region associated with the construction and operation of demonstration project; under A there would be no such project and, hence, no impact.

The commercial stage would proceed in two phases. In Phase I, a 50,000 barrel per day plant would be built that would employ 1,500 operating personnel. Phase II would double plant capacity and would increase operating personnel to a level of 2,300.

In the following, only alternative B is considered explicitly. This is done because:

A) The ultimate impacts are the same for both alternative plans;

B) The impacts in years (1) to (4) associated with the Utah demonstration project should be identified in the event that alternative is selected.

2.1 Direct Employment Impacts

The time schedule for direct employment (i.e., the construction and operating workforce at the oil shale complex) for both alternatives A and B is outlined in Table 2.1-1. Although the date of initial construction activity at the site is not known with certainty at this time, the earliest estimate is sometime in 1977. Therefore, year (1) in the tables in this chapter should be associated with 1977, although the reader is cautioned that this assignment is tentative.

Three time periods are identified: 1) commercial development stage, years (1) through (4); 2) the first phase of the commercial stage; and 3) the Phase II of the commercial stage wherein a 100,000 barrel per day mining and processing complex will complete a full operation.

During the commercial development stage there will be 400 construction workers at the site for about two years and an operating workforce of 300 beginning about the third year. Phase I of the commercial stage involves a significant increase in the size of the operating workforce to a level of 1,500 about the seventh year of operation. This is also a period of substantial construction activity with that workforce peaking at 2,000 midway through Phase I.

Phase II of the commercial stage begins about year (10); at this point the construction activity is complete and there are no further impacts from that source. Operating employment during this phase is 2,300 workers.

TABLE 2.1-1 ANNUAL DIRECT CONSTRUCTION AND OPERATING EMPLOYMENT, WHITE RIVER OIL SHALE COMPLEX, ALTERNATES A AND B

Year	Construction		Operating		Total	
	A	B	A	B	A	B
Commercial Development Stage						
1	--	400	--	--	--	400
2	--	400	--	--	--	400
3	--	--	--	300	--	300
4	--	--	--	300	--	300
Commercial Stage Phase I						
5	500	1,000	--	300	500	1,300
6	1,000	1,500	--	300	1,000	1,800
7	1,500	2,000	--	300	1,500	2,300
8	2,000	2,000	1,500	1,500	3,500	3,500
9	1,500	500	2,000	2,000	3,500	2,500
10	500	--	2,300	2,300	2,800	2,300
Commercial Stage Phase II						
15	--	--	2,300	2,300	2,300	2,300
20	--	--	2,300	2,300	2,300	2,300

SOURCE: White River Oil Shale Project.

2.2 Indirect Employment Impacts

The direct employment at the complex itself represents only a part of the total economic impact on the study region. Based on the analysis in Appendix A, multipliers were developed that related change in indirect or off-site employment to change in direct employment. This multiplier is estimated to be 0.3 in year (1), increasing to 1.0 by year (10), and finally reaching 1.5 in year (15) (see Appendix A). This means that for every direct job in year (1), there will be 0.3 indirect jobs created.[a] By year (10), one indirect job will be generated by each job at the oil shale complex. Because of the different techniques used for estimation of employment multipliers, one can find a range of estimates. The multipliers used herein are comparable to those developed and used in similar impact analyses. (For examples, see Booz, Allen & Hamilton (1974), Colony Development Operation (1974), and Gilmore and Duff (1973)).

The lower multipliers in the early period reflect three factors:

A) The somewhat smaller response to the temporary construction phase in years (1) and (2); the theoretical basis for this is outlined by Lewis (1972);

B) A lag in the response of the nonbasic or indirect sectors (e.g., retail, services, and government) to change in direct employment; and

C) The growing size of the regional economy. It is well-known

[a]The lag in the response of indirect employment to changes in basic employment is accounted for implicitly in the multiplier itself as explained below.

that the employment multiplier increases with the economic size of the region.[a]

As shown in Table 2.2-1, the level of indirect employment is not large in the commercial development stage, totaling only 150 workers in year (4). However, the indirect impacts in the commercial stages are significant; the Phase I peak is 2,450 workers and the ultimate impact, reached during Phase II, is 3,450.

Total employment impacts are outlined in Table 2.2-2. During Phase I of the commercial stage, total employment rises to a peak of 5,950 and then declines to a level of 4,600 in year (10). This decline, of course, is explained by the phase-out of construction activity in years (9) and (10) and the impacts of that phase-out on indirect employment. In Phase II, the total employment impact is 5,750. Note that in this final stage, indirect employment exceeds that directly employed at the oil shale complex. Recall that the ultimate impact is the same under either of the alternative development plans A and B.

Under the baseline projection (Western Environmental Associates, 1975), total employment in the study area is projected to be 17,200. The total (direct and indirect) effect of the proposed action would be to increase employment by about one-third.[b]

---

[a] This is documented in Appendix A and in Booz, Allen & Hamilton (1974).

[b] Comparisons of population and economic projections on a "with" and "without" oil shale basis are outlined in detail in section 2.5.

TABLE 2.2-1

ANNUAL INDIRECT EMPLOYMENT IMPACTS OF THE PROPOSED SHALE OIL COMPLEX, ALTERNATE B

Year	Indirect		
	Construction-Based	Operations-Based	Total
Commercial Development Stage			
1	120	--	120
2	120	--	120
3	--	120	120
4	--	150	150
Commercial Stage-- Phase I			
5	500	150	650
6	750	150	900
7	1,200	180	1,380
8	1,400	1,050	2,450
9	450	1,800	2,250
10	--	2,300	2,300
Commercial Stage-- Phase II			
15	--	3,450	3,450
20	--	3,450	3,450

TABLE 2.2-2 DIRECT, INDIRECT, AND TOTAL EMPLOYMENT IMPACTS, WHITE RIVER OIL SHALE COMPLEX, ALTERNATE B

Year	Employment Impacts		
	Direct	Indirect	Total
Commercial Development Stage			
1	400	120	520
2	400	120	520
3	300	120	420
4	300	150	450
Commercial Stage--Phase I			
5	1,300	650	1,950
6	1,800	900	2,700
7	2,300	1,380	3,680
8	3,500	2,450	5,950
9	2,500	2,250	4,750
10	2,300	2,300	4,600
Commercial Stage--Phase II			
15	2,300	3,450	5,750
20	2,300	3,450	5,750

2.3 Population Impacts

Clearly, the large employment impacts just reviewed will have a significant effect on population and, of course, number of households in the Uintah Basin. Population and household multipliers were developed and are outlined in Appendix A; they are consistent with those used in impact assessments of other major actions in the intermountain area. Essentially, the population-employment multiplier in the early years (i.e., 1 through 4) ranges from 2.7 to 2.9, then declines slowly, reaching 2.18 during the Phase II of the commercial stage. The household multiplier (i.e., households per worker) starts at a level of 0.90 in years (1) and (2), and then declines to a constant level of 0.68 in final phase of operations.[a]

The decline in the population and household multipliers reflects two trend components. First, in most cases, families will come into the area because the family head has secured or expects to secure employment either in the oil shale operation or in other local service industries (i.e., indirect employment). After a period of time other members of the family, the spouse or older children, may become potential entrants into the labor force, and many will be successful in finding employment. Second, the declining multiplier reflects the secular trend of increasing numbers of women in the labor force.

---

[a]All the multipliers for each year of operation are reported in Table A.2-1 of Appendix A.

The result of these factors is that in the early years of the project most new employment opportunities will accrue to either present residents of the area[a] or new in-migrants. Later other family members of the new families will absorb part of the new employment opportunities. This implies that labor force participation rates will increase or, equivalently, the ratio of population and households per worker will decline.

Based on the population multiplier and the employment projections, population impacts have been estimated and are reported in Table 2.3-1. In that table, the total impact is decomposed into the source of the population change: construction[b], operation, and indirect activity. During the commercial development stage, the population impact reaches a peak of 1,305 in year (4). Large increases are experienced in the early years of Phase I when population increases rapidly to 13,780 in year (8). The biggest single year increase is experienced in year (8) when population jumps by more than 5,000 people. This change will occur over a 12 to 18 month period.

The cumulative population impact is projected to decline in years (9) and (10) to just under 11,000 as construction activity phases out. During Phase II of the commercial stage, population will increase

---

[a]Present residents switching jobs will, of course, open up vacancies in the jobs they leave. This type of activity should not affect the total demand for employment.

[b]During the first two years of the pre-commercial stage, a downward adjustment was made on the population multiplier applied to construction employment. Because of the short-term duration of that activity it is expected that many construction workers will be single or will have smaller families. For documentation on this point see Colony Development Operation, 1974. Because of the duration of construction activity during the first commercial phase, no such adjustment is necessary.

TABLE 2.3-1 ANNUAL POPULATION IMPACTS OF THE WHITE RIVER OIL SHALE COMPLEX ON THE STUDY REGION, ALTERNATE B

Year	Population Impact: Construction Based	Operations-Based	Indirect-Based	Total
Commercial Development Stage				
1	600[a,b]	--	324	924
2	600	--	324	924
3	--	870	348	1,218
4	--	870	435	1,305
Commercial Stage--Phase I				
5	2,030	792	1,716	4,538
6	3,050	792	2,376	6,218
7	3,960	771	3,546	8,277
8	2,865	3,765	6,150	13,780
9	940	3,880	5,490	11,310
10	--	5,451	5,451	10,902
Commercial Stage--Phase II				
15	--	5,014	7,521	12,535
20	--	5,014	7,521	12,535

[a]Based on a population per construction worker of 1.5.

[b]Population per construction worker = 0.77 x population multiplier used for operating and indirect employment (see text for further explanation).

to a projected level of 12,535, about 1,200 below the peak attained during the Phase I activity. This impact would increase the 1990 level of population in the study region by about 31 percent over the baseline projection of 39,800.

Projections of households, a critical element in the deviation of housing demand estimates, are shown in Table 2.3-2. The time path of the household impact is proportionate to population, but, of course, the number of households is only about one-third of the population figure. Peak number of households is reached in year (8) at 4,522; the ultimate cumulative impact during Phase II will reach a level of 3,910 households.

TABLE 2.3-2 IMPACT ON NUMBER OF HOUSEHOLDS IN THE STUDY REGION, ALTERNATE B

Year	New Households by Demand Source: Construction-Based	Operations-Based	Indirect-Based	Total
Commercial Development Stage				
1	270	--	108	378
2	270	--	108	378
3	--	264	105	369
4	--	264	132	396
Commercial Stage--Phase I				
5	800	240	520	1,560
6	1,200	240	720	2,160
7	1,560	234	1,076	2,870
8	1,520	1,140	1,862	4,522
9	370	1,480	1,665	3,515
10	--	1,656	1,665	3,312
Commercial Stage--Phase II				
15	--	1,564	2,346	3,910
20	--	1,564	2,346	3,910

2.4 Income Impacts

The income impact of the proposed action on the Uintah Basin will be massive. The wage income impacts by year are shown in Tables 2.4-1 and 2.4-2. In the first of these tables, wage levels for the construction, operations, and indirect sectors are assumed constant; in Table 2.4-2 the annual wage reflects a 2.6 percent annual increase for productivity advance.[a] Because the future course of inflation is impossible to predict, no allowance is made for that factor in the projection of wage rates; therefore, all the income data is in real or constant purchasing power units.[b]

Focusing on the data in Table 2.4-2, total income generated as a result of the proposed action will reach a level in excess of $123 million in year (8). The breakdown by source is as follows:

Direct:	Construction	$65.6 million
	Operation	26.5 million
Indirect:		30.9 million
TOTAL		$123.0 million

In Phase II, year (15), there is no construction impact, but the combined income from operations and indirect source exceeds $114 million. The relative magnitude of this impact can be shown by relating

---

[a] The annual percentage change in output per man hour (i.e., productivity) for the private non-farm sector during both the periods 1950-73 and 1960-73 has averaged 2.6 percent. See U.S. Department of Labor, 1974. It is assumed that real wage rates in the study region will parallel productivity growth in the national economy. There is no implication intended that productivity gains in the proposed oil shale complex would necessarily equal this national average.

[b] It is important to point out that the wage rates shown in Tables 2.4-1 and 2.4-2 will accrue in future years. They should not be compared to wage rates being paid currently but only to projected wage levels for future years.

TABLE 2.4-1

ANNUAL WAGE INCOME IMPACTS OF THE WHITE RIVER OIL SHALE COMPLEX ON THE STUDY REGION, ALTERNATE B, NO PRODUCTIVITY ADJUSTMENT FOR WAGE RATES

	Construction			Operations			Indirect			
Year	Annual Wage Rate	Employment	Total Wages (000)	Annual Wage Rate	Employment	Total Wages (000)	Annual Wage Rate	Employment	Total Wages (000)	Total Wage Income (000)
Commercial Development Stage										
1	$27,400	400	$10,960	$14,800	--	--	$10,500	120	$ 1,260	$ 12,220
2	27,400	400	10,960	14,800	--	--	10,500	120	1,260	12,220
3	--	--		14,800	300	$4,440	10,500	120	1,260	5,700
4	--	--		14,800	300	4,440	10,500	150	1,575	6,015
Commercial Stage Phase I										
5	27,400	1,000	27,400	14,800	300	4,440	10,500	650	6,825	38,665
6	27,400	1,500	41,400	14,800	300	4,440	10,500	900	9,450	54,990
7	27,400	2,000	54,800	14,800	300	4,440	10,500	1,380	14,490	73,730
8	27,400	2,000	54,800	14,800	1,500	22,200	10,500	2,450	25,725	102,725
9	27,400	500	13,700	14,800	2,000	29,600	10,500	2,250	23,625	66,925
10	--	--	--	14,800	2,300	34,040	10,500	2,300	24,150	58,190
Commercial Stage Phase II										
15	--	--	--	14,800	2,300	34,040	10,500	3,450	36,225	70,265
20	--	--	--	14,800	2,300	34,040	10,500	3,450	36,225	70,265

TABLE 2.4-2

ANNUAL WAGE INCOME IMPACTS OF THE WHITE RIVER OIL SHALE COMPLEX ON THE STUDY REGION, ADJUSTING WAGE RATES FOR REASONS OTHER THAN INFLATION, ALTERNATE B

Year	Construction			Operations			Indirect			Total Wage Income (000)
	Annual Wage Rate	Employment	Total Wages (000)	Annual Wage Rate	Employment	Total Wages (000)	Annual Wage Rate	Employment	Total Wages (000)	
Commercial Development Stage										
1	$27,400	400	$10,960	$14,800	---	---	$10,500	120	$ 1,260	$ 12,220
2	28,100	400	11,240	15,200	---	---	10,800	120	1,296	12,536
3	---	---		15,600	300	$ 4,680	11,100	120	1,322	6,012
4	---	---		16,000	300	4,800	11,300	150	1,695	6,495
Commercial Stage Phase I										
5	30,400	1,000	30,400	16,400	300	4,920	11,600	650	7,540	42,860
6	31,200	1,500	46,800	16,800	300	5,040	11,900	900	10,710	62,550
7	32,000	2,000	64,000	17,300	300	5,190	12,200	1,380	16,836	86,026
8	32,800	2,000	65,600	17,700	1,500	26,550	12,600	2,450	30,870	123,020
9	33,600	500	16,800	18,200	2,000	36,400	12,900	2,250	29,025	82,225
10	---	---	---	18,600	2,300	42,780	13,200	2,300	30,360	73,140
Commercial Stage Phase II										
15	---	---	---	21,200	2,300	48,760	15,000	3,450	51,750	100,510
20	---	---	---	24,100	2,300	55,430	17,100	3,450	58,995	114,425

this income impact to the estimated level of wage income in 1974:

County	1974 Estimated Wage Income (millions)
Duchesne	$ 30.7
Uintah	47.9
Rio Blanco	28.2
	$106.8

The total wage income impact of the oil shale complex in year (15) is projected at $114.4 million. Thus, in real terms, the proposed project will more than double the current wage income base of the region.

2.5 Population and Income Growth With and Without Oil Shale Development

Because there will be a significant change in population in the study region without oil shale development, it is important to compare population growth with and without the proposed action. The comparison is provided in Table 2.5-1, which also shows the incremental change in population each year and the source of that change, i.e., whether it was the result of oil shale activity or other factors. The population projection is taken from the original baseline study prepared for the White River Shale Project (Western Environmental Associates, 1975).

Without oil shale development, population in the study region is projected to peak at almost 43,000 in 1980 and then decline modestly through 1991, to a level of 39,800. With implementation of the White River proposal, population will grow more rapidly, peaking at a level of 55.5 thousand in 1984. Population in the region is projected to decline by about 3,500 persons through 1986 as construction activity winds down and those workers and their families leave the area for employment opportunities elsewhere.

By 1991 when the impacts of Phase II have been fully absorbed, population in the study area is projected at 52,365, compared to a level of 39,800 under the no-project alternative. Thus, at full capacity the development will mean population will be higher by 12.5 thousand or about 31 percent more than would otherwise be the case.

Income projections with and without oil shale development in the region are reported in Table 2.5-2. Income is broken down into two

TABLE 2.5-1

COMPARISON OF POPULATION GROWTH PATH IN THE STUDY REGION WITH AND WITHOUT OIL SHALE DEVELOPMENT, 1975-1991

Year	Baseline projection[b]	Projection with Oil Shale complex[a]	Incremental growth impact with Oil Shale development[c]		
			Total	Attributable to Oil Shale complex	Attributable to other factors
1975	39,815	39,815			
			623	--	623
1976	40,438	40,438			
			1,549	924	625
1977	41,063	41,987			
			623	--	623
1978	41,686	42,610			
			918	294	624
1979	42,310	43,528			
			711	87	524
1980	42,934	44,239			
			2,935	3,233	-298
1981	42,636	47,174			
			1,382	1,680	-298
1982	42,338	48,556			
			1,761	2,059	-298
1983	42,040	50,317			
			5,205	5,503	-298
1984	41,742	55,522			
			2,768	-2,470	-298
1985	41,444	52,754			
			-706	-408	-298
1986	41,118	52,048			
					-326
1991	39,800	52,365	315[d]	1,633[d]	-1,318[d]

[a] Alternate B.

[b] From baseline study; see Western Environmental Associates, 1975.

[c] Increment shown as change from one year to the next.

[d] Change over the first five years of Phase II.

TABLE 2.5-2 INCOME PROJECTIONS IN THE STUDY REGION WITH AND WITHOUT OIL SHALE DEVELOPMENT, ADJUSTING WAGE RATES FOR FACTORS OTHER THAN INFLATION

	Baseline Projection					
	No oil shale complex			With oil shale complex, alternate B		
	Total	Wages and salaries	Other[a]	Total	Wages and salaries	Other[a]
1974 (estimated)	$155.8	$106.8	49.0	$155.8	$106.8	49.0
Commercial Development stage (year)						
1[b]	190.0	130.2	59.8	207.7	142.4	65.3
2	197.7	135.5	62.2	215.9	148.0	57.9
3	205.8	141.7	54.1	215.5	147.7	67.8
4	214.2	146.8	67.4	223.6	153.3	70.3
Commercial Stage Phase I						
5	218.2	149.5	68.7	280.7	192.4	88.3
6	222.3	152.4	69.9	313.6	215.0	98.6
7	226.5	155.3	71.2	314.1	241.3	72.8
8	230.7	158.1	72.6	410.1	281.1	129.0
9	235.0	161.1	73.9	354.9	243.3	111.6
10	239.3	164.0	75.3	345.9	237.1	108.8
Commercial Stage Phase II						
15	263.5	180.6	82.8	410.1	281.1	129.0

[a] Includes proprietor's income (including farms), property income, and net transfer payments.

[b] About 1977.

components--wages-salaries and other (i.e., proprietors income, property income, and net transfer payments)--based on the assumption that the wage-salary proportion of total personal income will maintain its 1974 level. Assuming an oil shale complex is built, annual total personal income in the region is projected at $410.1 million; this is almost $150 million more than projected under the no-project alternative. In year (15), per capita personal income is projected at $7800 with oil shale development, compared to $6600 under the no-project alternative; the welfare implications for area residents are obvious.

In addition to oil shale development, there is the possibility that other significant economic activities may develop in the study region. Although it is impossible to assign probabilities to these developments or to even approximate their quantitative socio-economic impacts, it is essential that the potential developments be identified. Because of the petroleum production activity in the area, consideration is being given to further industrial integration by the development of an oil refinery, a dewaxing plant, and/or a petro-chemical complex. A continuation of high oil prices might also give impetus to programs to extract petroleum products from tar sands. Furthermore, there are proposed, other oil shale mining and processing activities in the area.

Although it is impossible to estimate the impact magnitude of any one or several of these potential events, consideration of the base-line projection and impacts of the White River complex should be done with full realization of the potential for significant deviations from the projected trend-lines associated with the potential developments just reviewed.

2.6 Distribution of Population Impact Within the Region

A gravity model[a] was used to allocate the population impact of the proposed action among the four urban areas in the region (i.e., Duchesne, Roosevelt, Vernal, and Rangely) and to a category referred to as "other parts of the Basin." This allocation is made on both a "with" and "without" new town basis; the results are summarized in Tables 2.6-1 and 2.6-2, respectively.

Under the "no new town" alternative (Table 2.6-1), 30.0 percent of the construction population impact and 10.0 percent of the population impact associated with operating employment is allocated to a construction camp or similar facility on or near the site. Five percent of the off-site impact is expected to accrue to area locations other than the four primary cities identified above.[b] Peak impacts on the area are experienced after year (10) when the Phase II plant is operational. Under this alternative, the cumulative population increase in Vernal would be almost 4,000 and more than 5,000 in Rangely.[c] Duchesne and Roosevelt would experience increases estimated at 479 and 1,574, respectively.

---

[a] The model used was of the form $G_i = P_i/D_i^2$, where G_i, P_i, and D_i represent the gravity index, population, and highway distance from the site, respectively, for the ith city. The gravity proportions, (α_i) used in the tables are determined as $\alpha_i = G_i/\Sigma_i G_i$.

[b] These allocation proportions are discussed more fully below.

[c] The largest impacts would be in Rangely because of its relatively close proximity to the site.

TABLE 2.6-1

GRAVITY MODEL DISTRIBUTION OF POPULATION IMPACT AMONG PRINCIPAL URBAN PLACES IN THE STUDY REGION ASSUMING NO NEW TOWN IS CONSTRUCTED

Year	Cumulative total population impact	Duchesne[a]	Roosevelt[a]	Vernal[a]	Rangely[a]	At or near site[b]	Other parts of Uintah Basin[c]
Commercial Stage Phase I							
5	4,538	152	500	1,257	1,713	688	227
6	6,218	206	678	1,704	2,324	994	311
7	8,277	277	911	2,290	3,121	1,265	414
8	13,780	485	1,595	4,010	5,466	1,536	689
9	11,310	419	1,376	3,461	4,718	770	566
10	10,902	412	1,354	3,405	4,641	545	545
Commercial Stage Phase II							
11-15	12,535	479	1,574	3,958	5,396	501	627
16-20	12,535	479	1,574	3,958	5,396	501	627

[a] Gravity proportions for distribution of urban population:

Duchesne	0.042
Roosevelt	0.138
Vernal	0.347
Rangely	0.473

[b] Basic assumptions for on-site population projections: 1) 30.0 percent of the construction force would live in the construction camp at or near the site. 2) 10.0 percent of the operations force would live at or near the site.

[c] Five percent of total population impact is allocated to non-urban parts of the Uintah Basin.

TABLE 2.6-2

GRAVITY MODEL DISTRIBUTION OF POPULATION IMPACT WITH NEW TOWN

Year	Population Impact	New town[a]	Duchesne[b]	Roosevelt[b]	Vernal[b]	Rangely[b]	Other parts of Uintah Basin[c]
Commercial Stage Phase I							
5	4,538	3,630	36	119	299	408	45
6	6,218	4,974	50	163	410	559	62
7	8,277	6,622	66	217	546	744	83
8	13,780	11,024	110	361	909	1,238	138
9	11,310	9,048	90	297	746	1,016	113
10	10,902	8,722	87	286	719	980	109
Commercial Stage Phase II							
11-15	12,535	10,028	100	329	826	1,127	125
16-20	12,535	10,028	100	329	826	1,127	125

[a] Based on an 80.0 percent capture rate for the new town.

[b] Gravity proportions for distribution of urban population outside "new town:"

Duchesne	0.042
Roosevelt	0.138
Vernal	0.347
Rangely	0.473

[c] Five percent of population impact outside new town is allocated to non-urban parts of the Uintah Basin. (The sum of individual population impacts may not equal total impact (column 2) due to rounding.)

Under the "new town" alternative (Table 2.6-2), 80.0 percent of the population impact is allocated to the new community[a] which is estimated to have a population of just over 10,000 after year (10).[b] Of course, the impacts on existing cities would be much smaller than under the "no new town" alternative. It is estimated that Vernal and Rangely would grow by 826 and 1,127, respectively.

The assignment of 30 percent of the construction force to a residential location at or near the project site is based on a review of the experience at a number of major construction projects in the United States. The proportion of construction workers choosing "on-site" residency will depend principally on the following variables: distance to alternative residential locations; relative price and quality of housing at the site and at alternative locations; and the range of recreational opportunities offered at the various residence alternatives. At this time it is impossible to predict these determining variables. Even distance, known with certainty now, may change if new highways are constructed. With existing highways, both Vernal and Rangely are within a one hour drive of the site, and are viable housing alternatives; new highways would make them even more attractive options for construction workers.

The experience with location of construction workers in other projects is summarized in Table 2.6-3. From a review of these projects

---

[a]The basis for an 80 percent population "capture rate" for the new town is outlined in section A.3 of Appendix A.

[b]The new town may take a variety of forms. The key feature is that it will be a planned development under the direction of one developer or coordinated group of developers. Under the "no new town" alternative there would undoubtedly be a variety of different housing developments scattered among the primary cities in the area.

TABLE 2.6-3

SUMMARY DATA ON CONSTRUCTION WORKER RESIDENTIAL LOCATIONS AT FOUR MAJOR PROJECTS

Project	Location	Peak construction workforce	Comments
Fairless Steel Works	Lower Bocks County, Pa.	11,000	"According to informed opinion, about 80 to 90 percent of these construction workers commuted from Philadelphia, Trenton, or other places within a radius of 50 miles from the site. Of the remainder [10 to 20 percent], about one half lived in trailers ..." (p. 61)
AEC Atomic Energy Plant	Richmond County, South Carolina	25,000	Temporary housing was built near the site for 4,500 construction workers. At peak occupancy only 24 percent of these units were occupied. This low rate was partly attributed to inaccurate estimates that 40 percent of the workers would be without families. Also "It would seem that the location of the barracks in small towns, more than a hour's drive from a large city, was a factor mitigating against full occupancy." (p. 505)
Dover Air Force Base	Dover, Delaware	N.A.[a]	"The major construction contracts had gone to New Jersey contractors from the Trenton area. The journey to work took about two hours each way on the turnpike and many of the workers commuted daily." (p. 333)
Air Force-Navy Training Center	Seneca County, New York	18,000	90 percent of construction workers came from outside immediate area. "Many workers traveled as far as 50 miles for housing quarters." (p. 84)

[a] N.A. --data not available.

Source: Breese, 1965.

several relevant facts emerge:

A) Construction workers are not adverse to commuting significant distances each day. Indeed, the nature of their work suggests that their work place location is highly variable and often distant.

B) Residential locations in larger communities are preferred to remote sites as long as the commuting distances are not intolerable. Presumably, the availability of recreation opportunities is an important determinant.

Based on these data and informed judgment, it was determined that the location of about 30 percent of the temporary construction force and 10 percent of the permanent workforce at or near the site was a reasonable approximation.

Because of the magnitude of the population impact (over 12,500 new residents) it was determined that virtually all of these new residents would be housed in or adjacent to the major population centers in the study area. The demand for sewerage, water, schools, police and fire protection, and other public services would be so great that it would be extremely difficult to meet outside of the dominant cities in the region. Furthermore, planning for this population impact, already underway throughout the area, would undoubtedly attempt to channel the growth into the four centers identified and/or the new town. For these reasons, only a small part of the population growth is projected to occur in the undeveloped parts of the study region.

3.0 IMPACT ON LAND AND WATER RESOURCES

3.1 Land Use Impacts

The land use impacts of the proposed action are highly significant especially in a period of increased sensitivity to the use of land and the various controls (e.g., zoning) applied thereto. The impacts include the land absorbed by the oil shale mining and processing plant itself, land used for transportation routes to and from the tracts, and the land used for housing and servicing the additional population. The following will concentrate on this last set of impacts--that associated with increased urbanization.

3.1.1 Land-use Absorption Coefficients

In order to evaluate the land-use impacts of alternative levels of population growth, a set of land absorption coefficients were developed that show the quantity of land demanded for various purposes per 100 increment in population.[a] The average land absorption coefficients reported in Table 3.1.1-1 are based on an evaluation of land requirements in a sample of new towns or other large scale real estate developments; a detailed summary of this evaluation is found in Appendix B.

---

[a]These coefficients will be for projecting land-use impacts in places other than the new town. Impacts on the latter area will be developed in Section 3.1.2, and will be based on engineering studies.

TABLE 3.1.1-1 LAND-USE ABSORPTION COEFFICIENTS: ACRES OF LAND USED PER 100 POPULATION CHANGE

Land-use	Average Absorption Coefficient	Land-use Absorption Coefficients	
		Intensive Development	Extensive Development
Residential	5.6	5.0	6.2
Commercial	1.0	0.9	1.1
Streets	2.0	1.8	2.2
Other public	2.0	1.8	2.2
Total	10.6	9.5	11.7

SOURCE: Based on data in Appendix B.

A range of land-use absorption coefficients was developed by taking the average plus or minus 10 percent. The lower coefficients would represent more intensive land development (i.e., greater ratio of population and households per acre of land) while the higher coefficients would represent a more extensive use of land. The data in Tables 3.1.2-1 through 3.1.2-4 reflect these "intensive" and "extensive" development possibilities.

3.1.2 Land-use Impacts Outside New Town

The range of land-use impacts under the no new town alternative are shown in Tables 3.1.2-1 and 3.1.2-2. The total impact ranges from 1,175 to 1,432 acres, of which 633 to 774 acres are for residential housing. The largest impacts are felt in Vernal (380-464 acres) and Rangely (515-629 acres). Land use demands for commercial activity and for public facilities will be concentrated in the four population centers listed in the table.

Under the new town alternative, the land-use requirements outside the new town are relatively modest (Tables 3.1.2-3 and 3.1.2-4). Total land demanded in Vernal is 78-95 acres and 109-134 acres in Rangely.

TABLE 3.1.2-1

ULTIMATE (YEAR 15) LAND-USE IMPACTS: NO NEW TOWN ALTERNATIVE, INTENSIVE LAND-USE

Land-use	Total	Duchesne	Roosevelt	Vernal	Rangely	At or near site	Other parts of study region
Residential	633	24	79	200	272	26	32
Commercial	104	5	14	36	49	a	a
Streets	228	19	29	72	97	9	12
Other Public	210	19	32	72	97	a	a
Total	1,175	47	154	380	515	35	44

[a]Only limited commercial and public facilities are projected for non-urban areas. The associated land-use impacts will be negligible.

SOURCE: Based on population data from Table 2.6-1 and land-use absorption coefficients from Table 3.1.1-1.

TABLE 3.1.2-2

ULTIMATE (YEAR 15) LAND-USE IMPACTS: NO NEW TOWN ALTERNATIVE, EXTENSIVE LAND-USE

Land-use	Total	Duchesne	Roosevelt	Vernal	Rangely	At or near site	Other parts of study region
Residential	774	30	97	244	332	32	39
Commercial	127	6	18	44	59	a	a
Streets	278	11	35	88	119	11	14
Other Public	253	11	35	88	119	a	a
Total	1,432	58	185	464	629	43	53

[a]Only limited commercial and public facilities are projected for non-urban areas. The associated land-use impacts will be negligible.

SOURCE: Based on population data from Table 2.6-1 and land-use absorption coefficients from Table 3.1.1-1.

TABLE 3.1.2-3

ULTIMATE (YEAR 15) LAND-USE IMPACTS, NEW TOWN ALTERNATIVE, INTENSIVE LAND-USE

Land-use	Total	New Town	Duchesne	Roosevelt	Vernal	Rangely	Other parts of study region
Residential	841	716	5	16	41	57	6
Commercial	111	90	1	3	7	10	a
Streets	1,532	1,441	2	6	15	21	3
Other			2	6	15	21	a
Agriculture and Open Space	900	900[b]	--	--	--	--	--
Total	3,384	3,147	10	31	78	109	9

[a] Only limited commercial and public facilities are projected for non-urban areas. The associated land-use impacts are negligible.

[b] This open space will be usable for urban purposes (i.e., residential, commercial, and industrial use) should the proposed new town continue to grow beyond the impacts outlined here.

SOURCE: Based on population data from Table 2.6-2 and land-use absorption coefficients from Table 3.1.1-1.

TABLE 3.1.2-4

ULTIMATE (YEAR 15) LAND-USE IMPACTS, NEW TOWN ALTERNATIVE, EXTENSIVE LAND DEVELOPMENT

Land-use	Total	New Town	Duchesne	Roosevelt	Vernal	Rangely	Other parts of study region
Residential	1,028	875	6	20	50	70	7
Commercial	136	110	1	4	9	12	a
Streets	1,871	1,761	2	7	18	26	4
Other			2	7	18	26	a
Agriculture and Open Space	1,100	1,100[b]	--	--	--	--	--
Total	4,135	3,846	11	38	95	134	11

[a] Only limited commercial and public facilities are projected for non-urban areas. The associated land-use impacts are negligible.

[b] This open space will be usable for urban purposes (i.e., residential, commercial, and industrial use) should the proposed new town continue to grow beyond the impacts outlined here.

SOURCE: Based on population data from Table 2.6-2 and land-use absorption coefficients from Table 3.1.1-1.

3.1.3 New Town Land Use

The land-use impacts associated with the proposed new town development are outlined in Table 3.1.3-1.[a] These data represent the ultimate land-use impact in year (15) when a projected 10,000 population level is reached in the new town. Residential housing will require 795 acres with an average density of 3.9 housing units per acre. Commercial, public, recreation, and other uses account for an additional 2,731 acres, implying an overall population density of 2.84 persons per acre and a housing density of 0.89 units per acre. These somewhat low overall densities are explained by the large areas devoted to recreation and other types of open space.[b] Within the residential areas, the density will be at average levels.

---

[a] The land-use projections for the new town depend heavily on the feasibility study prepared by Call Engineering, Inc. (1975).

[b] This open space will be available for urban purposes should population growth in future years exceed projected levels.

TABLE 3.1.3-1 LAND-USE REQUIREMENTS FOR PROPOSED NEW TOWN (YEAR 15)

Land-use category	Dwelling units	Density (Density units/ gross acre)	Acres	Percent of total
Residential				
Sales housing				
Single family detached	1,275	2.5	510	14.5
Cluster	199	5.0	39	1.1
Mobile home subdivision	356	5.5	65	1.8
Subtotal	1,830	3.0	614	17.4
Rental housing				
Apartments	340	10.0	34	1.0
Mobile homes	787	6.0	131	3.7
Other	172	11.0	16	0.5
Subtotal	1,299	7.2	181	5.2
Total Residential	3,129	3.9	795	22.5
Commercial			100	2.8
Industrial			130	3.7
Public services[a]			841	23.9
Recreation and open space			560	15.9
Streets (arterials and collectors only)			100	2.8
Other open space			1,000	28.4
Total			3,526	100.0

[a]Includes allocation for airport and sanitary landfill.

SOURCE: Derived from data reported in Call Engineering, 1975.

3.2 Water Use Impacts

Water use impacts of the proposed action are significant if not in absolute magnitude then at least relative to limited supplies and the concern accorded inter-use transfers of water. The impacts on water use include those associated with the oil shale complex (i.e., mining, retorting, and power generating operations) and the municipalities and/or new town where additional project-related population will be located. Although both of these impacts on water use are examined in this study, consideration in this chapter is limited to the water resources associated with the oil shale complex. Impacts associated with additional population are discussed in Chapter 4.0 in the discussion of community facilities and services.

3.2.1 Water Demand

Evaluation of impact on water use can be accomplished with relative ease because it involves only one behavioral unit, the oil shale complex, and its water requirements are dictated by a choice among a limited range of technological alternatives. At this time, only one such technology, with respect to water use in the complex is available.

Based on preliminary estimates of water required by the mining, retorting, and electrical power generating components of the oil shale complex, full capacity operation will require approximately 26,500 acre feet of water per year. This quantity of water will be totally consumed

without return flow to the streams of the area--hence the diversion requirements and net depletion of the system are identical.

The estimated requirement of 26,500 acre feet per year can be put in perspective by comparing it to the magnitude of known water uses and river flow. For example, in 1965 net depletion requirements for agriculture within the Green River subbasin were estimated to be 831,939 acre feet. Ute tribe rights to undeveloped Upper Colorado Basin water are 387,000 acre feet per year.[a] Thus the impact of the proposed action represents an amount equivalent to 3.2 percent of 1965 levels of net depletion requirement for agriculture and 6.8 percent of Ute claims on Upper Colorado Basin supplies. In the vicinty of the proposed project site, annual useage of 26,500 acre feet represents only 5.6 percent of the thirty year mean annual flow of the White River at the Utah-Colorado border. Thus, water-use impacts associated with the addition of a single oil shale complex should not be cause for concern particularly if full allocation of the Upper Basin states including tributaries of the Colorado and the Green rivers can be utilized.

---

[a]This assumes that three acre feet of water per acre per year will be allowed for irrigation of each of the 134,009 acres of the Uintah Ouray Reservation determined to be arable and claimed under the Winters Doctrine.

4.0 IMPACTS ON COMMUNITY INFRASTRUCTURE

It is the purpose of this chapter to report estimated magnitudes of impact on community infrastructure that could be expected to occur within the study region with full implementation of the White River Shale complex in Uintah County. Significant increases in population and expanded purchasing power associated with higher income levels can be expected to place heavy demands on the existing infrastructure of the study area. Similarly, significant increases in the tax base and higher personal income will result in greater capacity to expand community infrastructure in both the public and private sectors. Thus, primary attention focuses on the adequacy of these expansions in capacity to forestall deterioration in the facility and/or availability of facilities and services within the area.

Discussion in the chapter addresses two topics. The first, section 4.1, is concerned with public budgets, including impacts on revenues and expenditures of the area. The second, section 4.2, examines impacts on the range of community facilities and services, including housing, education, utilities, public safety, health and hospitals, and recreation.

4.1 Public Budgets

Three topics of concern are addressed under the heading of public budgets. First are the expanded levels of expenditures by principal urban places and counties contained within the study region. This is followed by a discussion of the sources and magnitudes of public sector revenues to be generated with implementation of the project. The discussion concludes with a tentative determination of the proportions of these revenues which are potentially available to mitigate increases in the demands for public goods--subsumed in the expenditure levels reported in 4.1.1.

4.1.1 Expenditures

Tables 4.1.1-1 and 4.1.1-2 report expenditure levels associated with principal urban places and counties which comprise the study region. These estimates incorporate the assumption that the level of real expenditure per capita experienced between 1970 and 1974 would remain constant throughout the three project phases examined in this study.[a] Thus, annual expenditure rates per capita, as reported in the base-line study, were multiplied by the population increments associated with the project.

[a]Per capita levels of public expenditure may increase or decrease with significant population impact. However, a recent study of non-metropolitan counties in Utah (Johnson, 1975, under the direction of W. C. Lewis, Economics Dept., Utah State University) provides evidence of significant "scale economies" for virtually all categories of county expenditure. Thus, the use of constant levels of real public expenditure per capita could easily overstate the levels to be expected for the study region.

TABLE 4.1.1-1

PEAK ANNUAL IMPACT ON TOTAL PUBLIC EXPENDITURE[a] FOR PRINCIPAL URBAN PLACES IN THE STUDY REGION BY PROJECT PHASE WITH AND WITHOUT A NEW TOWN (1972 DOLLARS)

Year	Duchesne		Roosevelt		Vernal		Rangely	
	New Town	No New Town	New Town	No New Town	New Town	No New Town	New Town	No New Town
Commercial Development Stage (Years 1-4)	390	1,940	4,060	17,800	7,360	32,760	8,750	40,820
Commercial--Phase I (Years 5-10)	4,620	19,120	44,270	181,690	81,320	335,220	101,120	416,840
Commercial--Phase II (Years 11-20)	3,850	17,410	37,170	165,360	68,340	305,270	84,740	379,720

[a]Estimates are based on 1972 per capita expenditure rates (Department of Housing and Urban Development, 1972) and projected levels and distribution of population impact as presented in Chapter 2.0 of this report.

TABLE 4.1.1-2

PEAK ANNUAL IMPACT ON TOTAL PUBLIC EXPENDITURE[a] FOR COUNTIES IN THE STUDY REGION BY PROJECT PHASE WITH AND WITHOUT A NEW TOWN (1972 DOLLARS)

Project phase	Duchesne		Rio Blanco		Uintah	
	New Town	No New Town	New Town	No New Town	New Town	No New Town
Commercial Development Stage (Years 1-4)	1,760	7,670	24,120	116,350	58,450	26,600
Commercial--Phase I (Years 5-10)	18,690	77,830	282,970	1,175,860	667,420	354,900
Commercial--Phase II (Years 11-20)	15,770	70,610	237,360	1,066,200	559,620	269,380

[a]Estimates are based on 1972 per capita expenditure rates (operating budget) and projected levels and distribution of population impact as presented in Chapter 2.0 of this report (Department of Housing and Urban Development, 1972).

Examination of Table 4.1.1-1 for principal urban places reveals a striking pattern as between the new town and no new town alternatives. Quite obviously, the levels of expenditure are lower in existing places when a new town captures a significant portion of the population increment. In all project phases and irrespective of the existence of a new town, expenditures impact is greatest for the city of Rangely. Peak annual impact in all phases occurs during Commercial Phase I (years 5-10). For example, in Rangely expenditures above the baseline are $101,120 with the new town and $416,840 without it.

In examination of Table 4.1.1-2 for counties, a pattern similar to that found among cities is exhibited by Duchesne and Rio Blanco counties; however, impact on expenditures in Uintah County is positively influenced by the presence of a new town. As before, peak impacts occur during Commercial Phase I (years 5-10). The largest impacts on expenditure without a new town are in Rio Blanco County and exceed $1,000,000 per year, while with the new town, greatest impact is expected in Uintah County at $667,420.

Without the new town, the increment of peak impact after construction is completed in Commercial Phase II represents 41.0, 73.0, 94.0 and 316.0 percent of the 1972 total expenditure levels for Duchesne, Roosevelt, Vernal, and Rangely, respectively. With the new town, these percentages are 9.0, 16.0, 21.0, and 71.0. In counties, the increment of expenditure impact relative to the 1972 level of public expenditure for the same project phases are uniformly lower than the same measure for urban places.

The foregoing estimates should be considered as indicative of what could be expected with the project and should be viewed in light of several qualifications. An obvious omission is that no provision exists to give adequate reflection of scale economies which appear to be substantial for areas of this sort (Johnson, 1975). Significant scale economies would cause reported estimates of public expenditure to be too high.

The pattern and possibly the level of public expenditure attributed to the Commercial Development Stage may differ from those found in subsequent project phases because of the typically transitory nature of construction employment and population impact. Although a more definitive treatment of potential differences in expenditure pattern between construction and operations based populations may be warranted, lack of a precedent study and data prompted its exclusion from consideration here. Additionally, the mix of public services demanded may change significantly from those required during the baseline period because tastes and preferences and the age-sex composition of new residents may differ significantly from those of the baseline population.

4.1.2 Revenues

Major sources of public revenue and their magnitudes over the three major phases of the project are shown in Table 4.1.2-1. Although other potential sources of revenue, as suggested in the baseline, may be used, these are designated as most significant under current

TABLE 4.1.2-1

ANNUAL PUBLIC REVENUE IMPACT BY SOURCE AND BY PROJECT PHASE OF THE WHITE RIVER SHALE COMPLEX UNDER DEVELOPMENT ALTERNATE B

Year	Federal income tax on complex earnings ($000)	State income tax on complex earnings ($000)	Ad valorem property tax[a] ($000)	Federal easements and royalties ($000)	Federal income tax on individuals[b] ($000)	State income tax on individuals[c] ($000)	General sales tax[c] ($000)	Other property taxes[d] ($000)
Commercial Development Stage								
1	---	---	---	---	1,872	402	234	168
2	---	---	---	---	1,872	402	234	168
3	20,000	1,200	1,500	533	660	135	109	147
4	20,000	1,200	1,500	557	696	140	115	148
Commercial--Phase I								
5	20,000	1,200	1,500	667	5,030	1,070	739	661
6	20,000	1,200	1,500	667	8,016	1,592	1,051	926
7	20,000	1,200	1,500	667	10,140	2,155	1,410	1,207
8	e	e	7,500	3,200	11,210	2,353	1,964	1,540
9	e	e	7,500	3,200	8,080	1,641	1,279	1,422
10	e	e	5,000	6,400	6,486	1,288	1,112	1,400
Commercial--Phase II								
15	e	e	15,000	6,400	7,636	1,500	1,343	1,583
20	e	e	15,000	6,400	7,636	1,500	1,343	1,583

[a]Estimates of ad valorem tax are limited to the White River Shale complex. These estimates are based on the net income concept and include mining, retorting and electrical power generating facilities.

[b]Estimates of federal and state income tax are based on 1974 tax rates on expected incomes reported in Tabel 2.4-1.

[c]Estimates of state sales tax are income based and utilize factors for taxable retail purchases and leakages developed by the Denver Research Institute study of the Colony Shale Oil Complex in Western Colorado.

[d]Estimates of other property tax include expansion of residential and commercial properties and utilize 1974 mill levies and value assessments. Market values on housing are based on data presented in Roberts, 1975. Average value on permanent housing units is $25,000 and average depreciated value on mobile homes is $5,000. Nominal dollar value of housing units for years after 1975 will exceed these estimates because of the high rate of price inflation. Tax derivable from commercial properties is based on floor space per $1,000 retail sales and prevailing assessments and mill levies.

[e]Annual income tax payments on complex earnings are expected to exceed $20.0 million federal and $1.2 million following year (8) of the project.

circumstances.[a] Special revenue provisions, programs and problems are discussed in section 4.1.3 of this chapter.

Data presented in Table 4.1.2-1 report only the increment of various forms of revenue directly attributable to project implementation. For example, federal income tax payments from residents of the Basin are expected to be $1,872,000 more in year (1) of the project and 7,636,000 in years (11) through (20) than they would have been without the project. In year 15 of the project, this represents a 56 percent increase over the baseline value of federal tax payments.

Estimates of state and federal income tax are based on projected wage incomes reported in Table 2.4-1 which do not incorporate a productivity adjustment. Therefore, they may underestimate the real magnitude of these two tax yields. The 1974 federal and state tax rate schedules for married taxpayers filing jointly were applied after adjusting wage earnings by average dependents per family and all permissible deductions. This, too, introduces a potential downward bias because of higher tax rates applicable to unmarried taxpayers which typically comprise a substantial portion of the work force.

Estimates of general sales tax also are based on total wage income of individuals directly and indirectly employed by the project. Factors utilized in converting income into disposable income, taxable sales, and subsequently to sales tax are similar to those reported in other studies of oil shale development in Western Colorado (Colony

---

[a]Payments of $75,596,800, the total bid on oil shale tracts Ua and Ub, are not shown in Table 4.1.2-1 but should overlap the Commercial Development Stage of the project. The state will receive a minimum of 37.5 percent of this amount.

Development Operation, 1974).

Federal and State income tax on the complex, ad valorem property tax and royalties, and bonus payments associated with easements for land use and mining reflect mid range values reported by planning studies prepared for the White River Shale Project. These were arrayed by project phase in accord with extent of full capacity development of the project. For example, ad valorem property tax is expected to range between $9,000,000 and $20,000,000 per year, given existing assessment rates and mill levies in the study area. The figure $15,000,000[a] was selected as a midpoint in the range and this estimate was subsequently scaled in proportion to developed capacity over the project phases (years (1)-(20)). Thus, with the completion of one half of full oil retorting capacity in year (8) of the project, ad valorem property tax was estimated at $7,500,000.

Estimates of other property tax are based on projected increments of residential and commercial development in the study area. Current mill levies and assessment rates were applied to the estimated value of housing and commercial establishments. Here again, as in the case of income tax on individuals, the other property tax estimate reflects only the incremental value above the baseline or, more specifically, the amount directly attributable to development and operation of the oil shale complex.

---

[a]Even with significant population induced impact on public expenditures, schools, etc. in the study region, it is anticipated that potential revenues will exceed public expenditures. The possibility of bank rolling by county governments is precluded by statuatory provisions which effectively require a "balanced budget." For this reason, all revenue estimates reported in Tables 4.1.2-1 and 4.1.2-2 should be viewed as "potential revenue" which could be collected if required by expanded levels of public expenditure.

Cursory examination of Table 4.1.2-1 reveals that the sum of all public revenues for any given year is far in excess of public expenditures reported in Tables 4.1.1-1 and 4.1.1-2. However, the determination of "revenue adequacy" is not so easily accomplished because only certain portions of revenue reported in Table 4.1.2-1 are available to governmental units within the study region. Table 4.1.2-2 provides an estimate of the sources and amount of revenues potentially available for use in the region.

First it will be noted that only sales tax, ad valorem property tax, other property tax and payments to federal government for easements provide revenue sources to the impacted area. Additionally, with the exception of "other property" only a small proportion of total revenue generated remains within the study region.[a] A very substantial state income tax paid by the oil shale companies could also be reallocated in part to the study region but is not included here.

Estimated total revenues available to the study region reported in Table 4.1.2-2 and total "peak" expenditures identified in Tables 4.1.1-1 and 4.1.1-2 are combined in Table 4.1.2-3 to show annual net revenue for the study region for the peak expenditure year in each project phase. Net revenues range from 1.7 million to a high of 17.2 million in Phase II. Given net revenues of this magnitude, revenue shortfalls should not occur after reaching Commercial Phase I. However, prior to that time and especially years (1) and (2) of the commercial

---

[a]See the notes (a) through (d) under Table 4.1.2-2 for an explanation of the calculation of revenue proportions which could be expected to remain in the study region.

TABLE 4.1.2-2

SOURCES AND AMOUNT OF ADDITIONAL REVENUE POTENTIALLY AVAILABLE FOR USE IN THE STUDY REGION BY PROJECT PHASE

Year	Revenue Sources: General sales tax[a] ($000)	Property tax[b] ($000)	Easements and royalties ($000)[c]	Revenue sharing[d] ($000)
Commercial Development Stage				
1	47	168	---	20
2	47	168	---	20
3	22	1,647	200	24
4	23	1,648	209	26
Commercial Phase I				
5	148	2,161	250	98
6	210	2,426	250	134
7	282	2,707	250	179
8	393	9,040	1,200	298
9	256	8,922	1,200	244
10	222	16,400	2,400	236
Commercial Phase II				
15	268.6	16,583	2,400	271
20	268.6	16,583	2,400	271

[a]The proportion of general sales tax available to local units of government was estimated to be 20 percent of total collections.

[b]Property tax includes those currently levied on real property and projected ad valorem property tax on capitalized net income of the shale oil complex. The figure reported here assumes that net transfer from uniform school fund is equal to the 28 mill assessment on property paid to the state.

[c]Estimates of easement payment available to communities is based on full local acquisition of the 37.5 percent of payments by the development firms to the federal government. Because this allocation is currently subject for change, this estimate is the maximum potentially available but it is unlikely that the full proportion will be made available. Currently only 10.0 percent is returned to the counties plus a proportional share of the 45.0 percent of mineral lease monies allocated to the uniform school fund.

[d]Estimates of federal revenue sharing are based on 1973 per capita rates for the study region. These per capita rates were multiplied by the population impact.

TABLE 4.1.2-3 NET ADDITIONS TO PUBLIC REVENUE[a] FOR THE STUDY REGION IN YEARS OF PEAK IMPACT BY PROJECT PHASE ASSOCIATED WITH DEVELOPMENT OF THE WHITE RIVER SHALE COMPLEX

	Revenues ($000)	Expenditures[b] ($000)	Net revenues ($000)
Commercial Development Stage (Year No. 4)	1,906.0	243.9	1,662.1
Commercial--Phase I (Year No. 8)	10,931.0	2,561.5	8,369.5
Commercial--Phase II (Years 11-20)	19,522.0	2,274.0	17,248.6

[a] These estimates of net revenue are based on revenues reported in Table 4.1.2-2 and expenditures by counties and principal urban places reported in Tables 4.1.1-1 and 4.1.1-2. Potential questions concerning the distribution of intra basin revenue among cities and counties in different states are not sufficiently well identified to be incorporated at this time. However, to the extent that these questions arise without resolution they could be expected to reduce the apparent adequacy of the revenue base.

[b] Expenditures reported here do not reflect potentially higher debt service costs associated with large capital expenditures by the public sector. Preliminary information suggests that these costs could absorb amounts in excess of $1.5 million dollars during the Commercial Development Stage.

development stage, serious revenue shortfalls are likely to occur in the absence of other revenue sources and/or direct grants from federal government. Also, the apparent adequacy of revenues following year (5) of the project will be influenced significantly by the extent of participation by the study region in the uniform school fund. Given a tax base of this magnitude, it may be to the advantage of area residents to assume full responsibility for school finance provided a realistic allocation of revenues is accomplished among governmental units within the study region.[a] The problem alluded to here is critical in determining revenue adequacy, since the dominant element in the tax base is the ad valorem property tax on the oil shale complex which is located in Uintah County. Thus, there is no guarantee that the distribution of revenues to other governmental units within the study area will be coincident with the location of increased population and expenditures. An additional qualification also pertains to the state and local shares of easement and use fees paid to the federal government by the oil shale companies. Quite obviously, an assumption that the full 37.5 percent which reverts to the state will in turn be allocated to local governments in the study region is unwarranted at this time.

---

[a]Participation in the uniform school fund is not easily changed because of statutory provisions in the State of Utah. Also the desirability of reducing participation may be offset by earmarked revenue sources not specific to the study area. The local share of the revenues for Utah's uniform school fund currently stand at 28.0 percent, trending downward from 33.0 percent in the 1970-71 school year.

On the positive side, however, is the possible augmentation of the state's share of payment.[a]

Some of the leading proposals and tentative legislative action which could serve to alleviate problems of tax lead-time and revenue adequacy are discussed in section 4.1.3 which follows.

4.1.3 Overview of Public Budget Problems

The problem of financing infrastructure in rapidly growing communities is the problem of raising revenues to provide necessary public utilities, structures, and services when and where needed. It concerns the availability, timing, and distribution of revenue, as well as the fiscal planning and administrative abilities of local governments.

In the study region as in most areas in the Western states, public revenue for financing infrastructure comes mainly from the municipal bond market and various federal capital support programs (grants, loans, revenue sharing, etc.). Under existing fiscal policies, these sources of revenue may prove inadequate to support a rapidly growing population. Current federal funds are allocated by formulas that discriminate against sparsely settled rural areas; and without new guarantees or

---

[a]During the first week of October, 1975, the House Interior Committee gave approval for increasing the state's share of mineral royalties and bonuses from the current 37.5 percent to 50.0 percent. The additional 12.5 percent was designated for allocation to socially and/or economically impacted areas. Additionally, the state has some prospect of increasing their share of these payments based on ownership of exchange lands located in the vicinity of the oil shale development.

insurance that would improve the rating of issuing municipalities, bonds will likely be inadequate to meet per capita requirements.

Since these traditional mechanisms for raising public revenue may be out of pace with, and insufficient for, the booming growth rate, the roles of the federal government, state government, and energy developers in providing infrastructure are currently being critically re-assessed. To round out this overview of public budget problems, a summary discussion of the potential of these respective roles is provided.[a]

4.1.3.1 The Role of the Federal Government. The role currently played by the federal government is twofold: first, it provides capital funds directly to local areas and, second, it makes regulations governing private and other public agencies and thus affects the ability of the agencies to contribute to the solution of the problem.

Special federal funding programs for energy impacted communities do not exist. Direct federal aid funds are allocated to these areas in competition with other high priority areas and under the assumption that the primary responsibility for developing capital supplies rests with the state and local government and the private energy resource developers. Federal aid to energy impacted areas of the Western interior is generally viewed by the federal government only as a capital source of last resort.

The federal role is under review. The Energy Resources Council (ERC), Council on Environmental Quality (CEQ), Department of Interior,

---

[a]From the Conference on Financing Infrastructure in Energy Development Areas sponsored by the Rocky Mountain Institute for Policy Research at Snowbird, Utah, in August, 1975.

and the Federal Energy Administration (FEA) all have vigorous policy re-examination projects underway. Congress and the General Accounting Office (GAO) are also involved. Several relevant pieces of legislation, including the Coastal Zone Management Act, are now pending in Congress. It is clear that a new federal role may soon be formulated. Options include:

A) Setting industry performance standards with respect to socio-economic impact;

B) Creating a federal energy development impact office similar to the Department of Defense (DOL) Office of Economic Adjustment;

C) Giving additional authority to the Regional Commissions;

D) Establishing special revolving funds;

E) Federal sponsored bond guarantee and bond insurance programs; and

F) Tax credits and other incentives to encourage industry to do the job.

4.1.3.2 The Role of State Government. The capacity of the state to contribute to the solution of the capital shortage is great. There is little doubt that by using its taxing power the state may generate from energy developers sufficient revenues to provide for the needs--both capital and operating--of the localities impacted by those developments. Moreover, the state is empowered to regulate development so as to minimize its impact.

State efforts to date have generally focused on two areas: raising revenues and allocating funds into impacted areas. On the revenue side,

most states have adopted severance and/or ad valorem taxes or are planning to do so.

A great deal of the state response to the challenges of impact has involved the creation of new functionally specific state authorities and the refurbishing of old ones (e.g., housing authorities, new money for road commissions and school systems, tec.). The result is a circumstance in which the budgets of some programs (i.e., those traditionally under state control, like schools and roads) are in heavy surplus, while other programs (e.g., those traditionally under local control, like fire, water and sewer) are suffering severe capital shortages.

Mechanisms for clearing up these budget imbalances exist in all states in the region but a traditional intergovernmental rivalry, particularly between city and county, prohibits their effective use.[a] States face other key hurdles to taking the lead role in solving the capital shortage. Of primary significance is the political impracticality of focusing its fiscal resources on energy impact to the exclusion of other impact problems--problems that are likely to be in more populous and politically powerful areas. A related hurdle is the fact that energy development is decidedly a phenomenon stimulated by national,

---

[a]Problems of this sort have been mitigated successfully in Rock Springs, Wyoming, with a carefully drawn set of inter-local agreements on revenue transfer and assignments of expenditure responsibilities.

not state, policy, and thus it is hard to justify a state responsibility more salient than the national one. If the national role is but a residual one, the state role can be one of restricting development until federal authorities develop a more active stance. Finally, states are often hampered by their very diversity of approach and potential; diversity in taxation, in business regulation, and ultimately in the quality of rural life leads to interstate flows of investment, people, and the side effects of development that may adversely affect the region as a whole.

In general, the potential of the states to solve the capital shortage is great and just beginning to be realized. Vigorous efforts to improve the state's flexibility and effectiveness in meeting this challenge is underway. Encouragement in these efforts is needed from the federal government, the local governments and the regional associations.

4.1.3.3 The Role of Market Capital. Capital investment funds flow into community development projects from sources in the nation's bond and stock markets both directly (e.g., tax free municipal bond sales) and indirectly (e.g., municipal improvements done by developers, usually real estate developers, as a condition to licensing). The private market for municipal bonds is presently the prime supplier of community development funds. The municipal bond market operates at a volume of some $25 billion annually nationwide; thus, it can easily handle the $100-200 million additional needed annually by energy impacted communities in the western interior. However, under current policies and market discipline it is unlikely that the market could respond at the required level given the risks inherent in the new energy developments, traditional

bonding limits, and the dearth of revenues or securities a community is able to muster on the front end to pledge against the payments. As a consequence, if the private bond market is to be effectively used as a source of public capital by these communities, new facilitative programs on the part of the state and federal governments must be developed.

Possible facilitative programs include bond guarantees, development agencies interposed between the capital markets and the municipalities, bond insurance, technical assistance, matching grant programs aimed at encouraging bond insurances, to name a few.

A wide variety of indirect mechanisms for getting market capital into community development exist. Large real estate developers typically undertake a wide range of activities in the capital markets to generate front end funds for both the public and private portions of their projects. Such real estate developers have been induced to come into the region by state, local, and federal government as well as by the private energy developers; occasionally energy developers have found it necessary to become directly involved in real estate development.

The potential for such indirect approaches to the capital market is much greater than for the direct approach because of the great financial sophistication and leverage of big private developers in comparison with the weakness of the small rural municipalities.

There are, however, limitations on indirect funding schemes. No real estate developer will come in on speculation without guarantees from the energy developers or government. Because of the remoteness, the size and the urgency of capital demand, the developments required may

cost considerably more than what comparable developments would cost in more built up areas; as a consequence real estate developers may be hesitant to move without subsidies from either the government or the energy industry.

4.2 Community Facilities and Services

The impact of increasing population and income on community facilities and services is developed for the seven major elements identified in the baseline study as being critical for impact analyses. Specific elements examined include: Housing in terms of magnitude of demand for housing units, its location and type of construction; Education at the elementary, junior high school and high school levels in terms of current levels of facilities utilization, demand for classrooms and teachers; Utilities including water supply, waste treatment, energy supply; Public safety in terms of personnel and vehicles required; Health facilities and services in terms of hospital beds and medical personnel; and recreational facilities in terms of maintaining existing levels of availability per capita.

4.2.1 Housing

Since 1970, rapid population growth in the study region has and continues to place heavy demand on the housing market. Virtually every housing unit in the area is being utilized and housing unit prices and rents have inflated significantly. Thus, it is virtually impossible to introduce an additional increment of demand without having appreciable impact on the housing market of the area. In sections which follow, the magnitude, qualitative characteristics and distribution of housing unit demand among existing cities are discussed under two alternatives, one which includes a new town and one which places this demand into existing communities.

4.2.1.1 Housing Demand and Location. Total demand for housing units and its distribution among principal urban places is reported in Tables 4.2.1.1-1 and 4.2.1.1-2. Information given in both these tables reflects development Alternative B and is arrayed by project phase and by years (1) through (20) inclusive of construction activity. Information contained in Table 4.2.1.1-1 was developed under the assumption that no new town[a] would be constructed outside existing population centers. In Table 4.2.1.1-2 this assumption was removed; that is, information contained in Table 4.2.1.1-2 reports the distribution of demand for housing units consistent with the development of a new town in close proximity to the mining/reporting complex in Uintah County.

Total housing demand, assignable to operation of the oil shale complex, is expected to exceed 4500 units at its maximum in the eighth year of the project and to level at approximately 3,900 units with full capacity production when all construction is completed typical of Commercial Phase II. Alternative A, if selected, will generate a slightly different pattern of increase in housing demand in the Pre-commercial and Commercial Phase I. Peak demand in Commercial Phase I would remain the same and Commercial Phase II would be identical to that estimated under development Alternative B. The implications for housing demand resulting from differences between projected and realized

---

[a]This assumption does not preclude the placement of a facility for construction workers near the site which is reported in the tables under column heading "At or near site."

TABLE 4.2.1.1-1

DISTRIBUTION OF HOUSING DEMAND[a] AMONG PRINCIPAL URBAN PLACES IN THE STUDY REGION WITH DEVELOPMENT ALTERNATIVE B ASSUMING NO NEW TOWN IS CONSTRUCTED

Year	Total housing demand	Duchesne	Roosevelt	Vernal	Rangely	At or near site	Other parts of study region
Commercial Development stage							
1	378	12	38	96	131	81	19
2	378	12	38	96	131	81	19
3	369	14	45	112	153	26	19
4	396	15	48	120	164	28	20
Commercial stage--Phase I							
5	1,560	49	161	405	552	316	77
6	2,160	67	220	554	755	456	108
7	2,870	89	293	737	1,006	600	145
8	4,522	149	489	1,226	1,674	756	226
9	3,515	122	402	1,011	1,378	426	176
10	3,312	118	398	996	1,331	332	167
Commercial stage--Phase II							
11-15	3,910	140	459	1,153	1,572	391	195
16-20	3,910	140	459	1,153	1,572	391	195

[a]This distribution of housing demand is consistent with gravity proportions and capture rates reported in Tables 2.6-1 and 2.6-2.

TABLE 4.2.1.1-2

DISTRIBUTION OF HOUSING DEMAND AMONG PRINCIPAL URBAN PLACES IN THE STUDY REGION UNDER DEVELOPMENT, ALTERNATE B, ASSUMING NEW TOWN IS CONSTRUCTED

Year	Cumulative total housing demand	New Town	Duchesne	Roosevelt	Vernal	Rangely	Other parts of study region
Commercial Development stage							
1	378	302	3	10	25	34	5
2	378	302	3	10	25	34	5
3	369	295	3	9	23	31	4
4	396	316	3	11	27	35	4
Commercial stage--Phase I							
5	1,560	1,248	12	41	103	140	16
6	2,160	1,728	17	57	142	194	22
7	2,870	2,296	23	75	189	258	29
8	4,522	3,618	36	119	298	406	45
9	3,515	2,812	28	92	232	316	35
10	3,312	2,650	26	87	218	298	33
Commercial stage--Phase II							
15	3,910	3,128	31	103	258	351	39
20	3,910	3,128	31	103	258	351	39

[a]This distribution of housing demand is consistent with gravity proportions and capture rates reported in Tables 2.6-1 and 2.6-2.

levels of development can easily be approximated in the mining and retorting aspects of the operation because these units typically are sufficiently large to fully incorporate scale economies. Each unit of increment or decrement could be expected to introduce approximately similar housing demands. However, a similar adjustment for utilization of residual products and generation of electrical power is not so easily accomplished and would require further study. In this analysis full development of Phases I and II with possible conversion of residual low BTU gas from the retorting process into electrical power is assumed.

The second major question addressed in treatment of housing demand is that of its location or distribution within the study region. Although total housing demand may be estimated correctly, its distribution will not be uniform throughout the region or its existing communities. The question is complicated further by the possibility that a new town may be constructed. If constructed, it could absorb a major portion of potential housing impact which would otherwise occur in the existing communities.

Estimates of the distribution of demand for housing units among principal urban places both without and with the new town were developed and are reported in Tables 4.2.1.1-1 and 4.2.1.1-2, respectively. The distributions utilized the same gravity proportions and capture rates as used for distributing population impact reported in Tables 2.6-1 and 2.6-2.

Examination of the tables reveals that a significant proportion of demand for housing units will occur in Vernal and Rangely whether or not a new town is constructed. Without the new town, peak demand

for additional housing units exceeds 1,200 units in Vernal and 1,600 units in Rangely. This represents 64.0 percent of the total implied increase in housing units. With development of a new town, under the assumptions specified in Chapter 2.0 of this report, demand for housing units would be reduced to 15.6 percent of the total or 704 units with approximately a 30:70 split between Vernal and Rangely. Under these circumstances, approximately 3,600 units would be required in the new town in the year of peak demand and about 3,100 units at full development of the complex. Roosevelt, in Duchesne County, is the only other urban place which could experience noticeable impact on housing. Without the new town, peak demand for housing units in Roosevelt would exceed 400 but would reduce to about 100 with development of the new town.

Although it is anticipated that virtually all new housing demand would be generated within existing communities or the new town, an array of housing demand by counties is presented in Table 4.2.1.1-3. As anticipated, greatest demand is found in Uintah County, followed by Rio Blanco and Duchesne. Development of the new town in Uintah County internalizes 87.1 percent of housing demand to Uintah County. Impact of this magnitude may be of concern to public officials in Uintah County because of its size relative to the existing housing base in the area. However, it could also serve to place the bulk of these demands within a governmental unit which could facilitate procurement of federal housing assistance for mitigation of the impact. Also, it is likely that associated costs such as transportation and public safety would be more closely associated with project based public revenues than under a more dispersed pattern of housing demand.

TABLE 4.2.1.1-3

DISTRIBUTION OF HOUSING DEMAND AMONG COUNTIES OF THE STUDY REGION UNDER DEVELOPMENT, ALTERNATIVE B, WITH AND WITHOUT A NEW TOWN

Year	No New Town			New Town		
	Duchesne	Rio Blanco	Uintah	Duchesne	Rio Blanco	Uintah
Commercial Development stage						
1	53	138	187	14	36	328
2	53	138	187	14	36	328
3	62	161	146	13	34	322
4	66	174	157	15	36	345
Commercial stage Phase I						
5	221	581	758	55	146	1,359
6	302	795	1,063	77	204	1,881
7	403	1,060	1,407	102	269	2,499
8	670	1,758	2,094	161	423	3,938
9	549	1,443	1,523	125	329	3,061
10	530	1,393	1,389	118	310	2,884
Commercial stage Phase II						
11-15	627	1,644	1,639	140	366	3,405
16-20	627	1,644	1,639	140	366	3,405

4.2.1.2 Housing Characteristics. Total demand for housing units provides useful estimates of impact on the housing markets of the various communities of the Basin. Additionally, it is essential to provide realistic assessment of the type of construction as between permanent and mobile units and the distribution of demand for housing units among various types of permanent units. Table 4.2.1.2-1 presents percentage ranges (low, medium, high) by type of worker which express the "probabilities" of a particular type of worker demanding a permanent housing unit. For example, based on studies of housing demand in other areas, it is anticipated that under "median" conditions, 20 percent of construction workers would demand some type of permanent housing, as would 70 percent of operating employees and 50 percent of indirectly employed individuals. This median level of percentages by type of worker was used in developing the matrix of housing construction type by type of worker found in Table 4.2.1.2-2.

Based on the research conducted by Roberts (1975), the median percentages appeared to be most reasonable for use in this study. However, if conditions warrant reestimation of the demand for permanent units because of more optimistic or pessimistic economic conditions or worker attitude, the high or low percentages could be incorporated.

In examining Table 4.2.1.2-2 at least three potentially troublesome impacts emerge. First, the magnitude of demand for permanent housing introduces the possibility that housing supply may not be able to expand fast enough to prevent rapid inflation of rental and purchase prices in permanent housing. Further, the relatively large number of mobile units demanded by construction workers cannot be fully absorbed by

TABLE 4.2.1.2-1 DEMAND FOR PERMANENT HOUSING UNITS BY TYPE OF WORKER

Type of worker	Percentage		
	Low	Median	High
Construction	0	20	30
Operating	55	70	75
Indirect	33	50	60

SOURCE: Roberts, 1975.

TABLE 4.2.1.2-2

MEDIAN FORECAST OF PEAK DEMAND FOR PERMANENT AND MOBILE HOUSING UNITS IN THE STUDY REGION BY TYPE OF WORKER AND BY PROJECT PHASE

Project phase	Construction		Operating		Indirect	
	Permanent	Mobile	Permanent	Mobile	Permanent	Mobile
Commercial Development Stage[a]	54	216	185	79	54	54
Commercial Phase I[b]	312	1,248	1,159	497	931	931
Commercial Phase II[c]	---	---	1,194	469	1,173	1,173

[a] Peak for construction worker housing occurs in year (1), and (2) for operating, and indirect in year (4).

[b] Peak for construction worker housing occurs in year (7), for operating based households in year (10) and for indirect based in year (8).

[c] No construction activity is planned and the level of housing demand for operating and indirect based household is assumed to be constant throughout this phase.

increases in operating and indirect housing demand following year (7) of Commercial Phase I. Quite obviously completion of the construction at the site will be followed by a significant export of mobile housing units from the Basin. A more serious problem would be introduced if permanent units were involved instead of mobile. Such an eventuality would develop if construction workers demanded permanent housing in similar proportions as operating and indirect employees. However, based on the median forecast of peak demands it appears that the latter impact will be minimal. The expansion in demand for permanent housing by operating and indirect employees following termination of construction is approximately equal to the number of permanent housing units being vacated. Admittedly, the transition of these housing shifts may not be accomplished easily because this supply may be of different type and location than is desired by permanent residents.

The distribution of demand for permanent housing units among single, multiple and group quarters are presented in Table 4.2.1.2-3. This distribution is based on 1972 census estimates of housing proportions reported for the study area. Recent experience in the Vernal and Roosevelt area suggests that the census proportions may understate the number of multiple and group units because of zoning restrictions and higher construction costs per unit associated with single units. For this reason, these data, especially the implied demand for single units, should be viewed as indicative but most likely too high to the extent that multiple and group quarters are underestimated.[a]

Examination of Table 4.2.1.2-3 reemphasizes the implications drawn from Table 4.2.1.2-2 concerning the gross magnitude of increase

[a]If a new town is constructed which incorporates a uniformly different housing density pattern and construction type for approximately 80 percent of new housing supply, historical patterns may be of marginal value in prediction. A dominant bias of this sort is not reflected in these estimates.

TABLE 4.2.1.2-3

DISTRIBUTION OF MEDIAN FORECAST OF DEMAND FOR PERMANENT HOUSING UNITS FOR THE STUDY REGION AMONG SINGLE UNIT, MULTIPLE UNIT AND GROUP QUARTERS BY PROJECT PHASE

Project phase	Single unit	Multiple unit	Group	Mobile and other
Commercial Development Stage[a] (Years 1-4)	218	25	8	145
Commercial Phase I[a] (Years 5-10)	1,769	203	61	2,489
Commercial Phase II[a] (Years 11-20)	1,972	227	68	1,643

[a]Peak total housing demand occurs in year (4) in Commercial development stage and in year (8) of Commercial Phase I. Demand is assumed to be constant throughout Commercial Phase II.

in permanent housing units which would be required between years (4) and (8) of the project. In terms of single units, this increase is expected to be in excess of 1,500 units, 175 for multiple units, and 50 for group units. Likewise, for mobile and other units, the implied expansion of demand between project years (4) and (8) exceeds 2,300 units, followed by a net reduction of about 800 units between years (8) and (11) following the termination of construction activity.

4.2.2 Education

Although the number of school age children per 1000 population has declined steadily since the mid 1960s in most regions of the United States as well as the study region, migration into the study region has been of sufficient magnitude to generate significant increases in the school age population at some locations which exceed the capacities of existing facilities and personnel. Thus, development of the oil shale complex and subsequent migration of families with children can be expected to introduce an additional increment of school enrollment beyond current capacity. In sections which follow, projected impacts on the educational facilities of the Basin are reviewed in terms of existing capacity utilization, projected enrollments, and implied demands for classroom facilities, teaching and administrative personnel, and budgets for maintenance, operation, and capital outlay.

4.2.2.1 Enrollments and Capacity Utilization. Enrollments and capacity utilization of classroom space[a] in Duchesne, Uintah and Rangely School Districts as of Fall, 1975, are presented in Table 4.2.2.1-1.

[a] Classroom space as defined here includes all temporary classroom units and usable space in substandard buildings but excludes shop, gymnasium and other non-classroom space.

TABLE 4.2.2.1-1

ENROLLMENTS[a] AND CAPACITY UTILIZATION OF CLASSROOM SPACE IN DUCHESNE, UINTAH AND RANGELY SCHOOL DISTRICTS, FALL 1975

Classes	District: Duchesne Enrollment	Duchesne Percent of capacity	Uintah Enrollment	Uintah Percent of capacity	Rangely Enrollment	Rangely Percent of capacity	Total study area Enrollment	Total study area Percent of capacity
Elementary (K-6)	1,980	90[b]	2,609	95	240	70	4,829	91
Junior High (7-9)	667	87[b]	1,210	95	140	65	2,017	84
High School (10-12)	1,161[d]	90[c]	1,017	135	240	50	2,418	96

[a]Enrollments reported are based on average count for the week completed October 3, 1975, which may deviate slightly from official State Board counts to be taken later in the term.

[b]Two temporary classroom units are included in existing classroom space. Without these units, current enrollments would exceed 100 percent of capacity.

[c]Current enrollment of 637 students in the Union High School is 127 percent of capacity. This excess is handled by using excess capacity in the Uintah Area Vocation Center. Additional space, equivalent to 10 classrooms can be made available on a permanent basis with completion of the new center and appropriate renovation of the old building.

[d]High school enrollment figures for Duchesne District include 200 students whose residence is in Uintah County.

Comparison with baseline information reveals enrollment increases of more than 500 students in Duchesne and Uintah Districts between Fall, 1974, and Fall, 1975. In these same two districts, enrollment has increased by more than 2,300 students or 36.3 percent since Fall, 1969. Thus, even where temporary classrooms and substandard space are available and included in space estimates, current capacity utilization is unusually high. This problem is further complicated by an enrollment distribution problem in which much of current and anticipated growth is occurring in areas within the districts which already have higher capacity utilization than the district averages represented in the table. Excess capacity in schools located in remote areas of the districts cannot be utilized to absorb expanded enrollments found in the urban places where growth is greater.

At the present time the Rangely District has greatest potential for absorbing enrollment impact. However, capacity utilization of all existing space in the Rangely District would provide enough space for about 30.0 percent of the anticipated increase in Rangely District's enrollment and less than 13.0 percent of peak enrollment impact for the study region when the oil shale complex is operating at full capacity in Phase II.[a] Thus, virtually all of the enrollment increment associated with development of the oil shale complex will require classroom space beyond current capacity.

4.2.2 Projected School Enrollments. Projected increase in enrollments for elementary, junior high and high schools in years (5),

[a]This conclusion is based on the no new town alternative.

(10), and (15) of the project are presented in Table 4.2.2.2-1. The increase above the baseline for the three districts range from 1,033 students in year (5) to a high of 3,094 by year (15). Greatest expansion in enrollment is found in the elementary schools with increments of 590, 1,485, and 1,825 in respective project years (5), (10), and (15). Ultimately, enrollment impact is expected to be greatest in absolute terms in Uintah District with the new town, but would shift to Rangely District without a new town. In the section which follows, enrollment increases presented in Table 4.2.2.2-1 are translated into estimated educational impact or implied demand for teachers and classroom space and impact on educational budgets.

4.2.2.3 Implied Demand for Educational Facilities, Services, and Budget. Increases in the demand for classroom space and teachers are shown in Table 4.2.2.3-1. Estimates of demand for teachers are based on the assumption of maintaining an average of 30 students per room. Consistent with projected increases in enrollment, greatest increases in demand for teachers and classrooms are found in Uintah District with the development of a new town where 108.5 teachers and 90.5 classrooms will be required with full development, while without the new town greatest impact is found in Rangely District.[a]

Table 4.2.2.3-2 shows implied increase in expenditures for maintenance and operation and for capital outlay associated with development of the oil shale complex. The pattern or distribution of impact parallels that of enrollment increases. Maximum impact with a new town is expected

---

[a]These estimates describe increases in demand rather than net increase above existing capacity. Thus impact could be somewhat less in Rangely District than in Duchesne and Uintah Districts because of Rangely District's relatively lower capacity utilization described in Table 4.2.2.1-1.

TABLE 4.2.2.2-1

PROJECTED ENROLLMENT IMPACT FOR ELEMENTARY, JUNIOR HIGH AND HIGH SCHOOLS BY SCHOOL DISTRICT ASSOCIATED WITH DEVELOPMENT OF THE WHITE RIVER SHALE COMPLEX WITH AND WITHOUT A NEW TOWN

District and grade level	Enrollment Impact					
	Project Year (5)		Project Year (10)		Project Year (15)	
	With new town	Without new town	With new town	Without new town	With new town	Without new town
Duchesne	35	148	89	422	106	507
Elementary	20	85	51	240	60	299
Junior High	6	27	17	97	19	111
High School	9	36	21	85	27	97
Uintah	2,265	495	2,282	1,074	2,710	955
Elementary	1,291	282	1,300	612	1,599	440
Junior High	408	89	525	247	596	276
High School	566	124	456	215	515	239
Rangely	93	390	234	1,109	278	1,332
Elementary	53	223	133	632	164	786
Junior High	17	70	54	255	61	293
High School	23	97	47	222	53	253
Total Area	1,033		2,604		3,094	
Elementary	590		1,485		1,825	
Junior High	186		469		680	
High School	257		651		589	

TABLE 4.2.2.3-1

IMPLIED INCREASE IN DEMAND FOR TEACHERS[a] AND CLASSROOMS[b] BY SCHOOL DISTRICT AND GRADE LEVEL WITH AND WITHOUT A NEW TOWN

Year and item	School Districts					
	Duchesne		Uintah		Rangely	
	With new town	Without new town	With new town	Without new town	With new town	Without new town
Project year (5)						
Teachers	1.5	6.0	90.5	20.0	4.0	15.5
Classrooms (total)	1.0	5.0	75.5	16.5	3.0	13.0
Elementary	0.7	2.8	43.0	9.4	1.8	7.4
Junior High	0.1	0.9	13.6	3.0	0.6	2.3
High School	0.2	1.3	18.9	4.1	0.6	3.3
Project year (10)						
Teachers	3.5	17.0	91.0	43.0	9.5	44.5
Classrooms (total)	3.0	14.0	76.0	36.0	8.0	37.0
Elementary	1.7	8.0	43.3	20.4	4.4	21.1
Junior High	0.6	3.2	17.5	8.2	1.8	8.5
High School	0.7	2.8	15.2	7.4	1.8	7.4
Project year (15)						
Teachers	4.0	20.5	108.5	50.0	11.0	53.5
Classrooms (total)	3.5	17.0	90.5	32.0	9.5	44.5
Elementary	2.0	10.0	53.3	14.7	5.5	26.2
Junior High	0.6	3.7	19.9	9.2	2.0	9.8
High School	0.9	3.3	17.3	8.1	2.0	2.5

[a] Demand for teachers is based on the assumption that a 25:1 pupil teacher ratio will be maintained.

[b] Demand for classrooms is based on an average of 30 students per classroom.

TABLE 4.2.2.3-2

IMPLIED IMPACT ON ANNUAL MAINTENANCE AND OPERATION AND CAPITAL OUTLAY BY SCHOOL DISTRICT ASSOCIATED WITH DEVELOPMENT OF THE WHITE RIVER SHALE COMPLEX WITH AND WITHOUT A NEW TOWN

	Increase in School Budgets[a]											
	Project Year (5)				Project Year (10)				Project Year (15)			
	With New Town		Without New Town		With New Town		Without New Town		With New Town		Without New Town	
District	Maintenance and operation ($000)	Capital outlay ($000)	Maintenance and operation ($000)	Capital outlay ($000)	Maintenance and operation ($000)	Capital outlay ($000)	Maintenance and operation ($000)	Capital outlay ($000)	Maintenance and operation ($000)	Capital outlay ($000)	Maintenance and operation ($000)	Capital outlay ($000)
Duchesne	8.5	0.9	36.0	3.6	21.6	2.2	102.5	10.3	25.8	2.6	123.2	12.3
Uintah	550.4	55.0	120.3	12.0	554.5	55.5	261.0	26.1	658.5	65.9	305.0	30.5
Rangely	22.6	2.3	94.8	9.5	56.9	5.7	269.5	27.0	67.6	6.8	323.7	32.4

[a] These estimates are based on projected enrollment increases attributed to the project and 1974 average levels of expenditure for maintenance and operation and for capital outlay. Nominal values which reflect current and/or expected inflation would be considerably higher than those reported here because they are expressed in constant 1974 dollars. Per capita expenditures are assumed to be $270 per year with 10.0 percent allocated to capital outlay. In the 1970s, this percentage has ranged between 6.0 and 9.5. Under conditions of low population density and with substantial expansion of facilities, capital outlay may exceed 25.0 percent of the annual budget (Real Estate Research Corporation, 1974). In Utah, debt service as a percent of M and O budget supplied from the uniform school fund cannot exceed 10.0 percent except by majority approval of the district's voters. Also it should be noted that state funds for capital improvement cannot be obtained under current policies until such time as the district is fully bonded and the levy for capital improvement is at least equal to 16 mills. Approximately $3.4, 5.1 and 1.6 million dollars of capital investment will be required for schools between Project years (0-5), (6-10), and (10-15). (Call Engineering, Inc., 1975)

to occur in Uintah District but would occur in Rangely in the absence of a new town. The largest increment of increase without a new town in Rangely district is expected to exceed 350 thousand dollars. This figure reduces to less than 100 thousand dollars with the development of a new town while comparable data for Uintah District increases from 335 thousand to more than 700 thousand.[a]

4.2.2.4 Other Educational Facilities. Demand for vocational, post high school and special education facilities and personnel will expand, with predicted increases in the region's population. In the case of vocational and technical training facilities, this impact should be more than proportional to population increase because of the relatively young immigrant population and the expected excess of demand for labor in job classifications which require limited technical training beyond high school.

Demand for university level training is expected to expand, but should have no discernable impact on the region except to enhance the feasibility of extension classroom programs offered by the universities of the state. Special educational facilities and personnel are currently under utilized, and increased student population should enhance the feasibility of existing programs found in the three school districts.

---

[a]These estimates are for full capacity operation of the oil shale complex and incorporate average 1974 expenditure levels for the area. Capital outlay was assumed to be approximately 10.0 percent of total annual expenditures. Enrollment impact of the magnitudes estimated above may require substantially higher capital outlay to service outstanding bonds on new facilities and equipment. Additionally, it should be recognized that the selling price and terms on major bond issues in the 1970s and 1980s may require greater provision for capital outlay than is implied in Table 4.2.2.3-2. In 1975 dollars, capital costs for the increment of enrollment impact expected by year (15) of the project will exceed 10 million dollars.

4.2.3 Utilities

The impact of an oil shale complex on utilities both in terms of projected demand and cost to the suppliers and users is of prime concern. Utilities examined as a part of this impact analysis include water supply, waste treatment, energy, and a miscellaneous category which includes telephone and communication services. These utilities are examined in terms of projected increase in demand and implied cost of development of new capacity sufficient to maintain their current levels of availability.

4.2.3.1 Water Supply. As noted in the baseline, the populated areas of the study region are located in arid and semi arid portions of the Colorado River basin. Early attempts to extend crop agriculture in the area were effectively constrained by limited water supplies. Although similar constraints have not been encountered by urban places and most industrial activities, significant expansion of usage for any purpose, including oil shale, can be expected to have important impacts either by displacing a part of existing water use or by precluding expansion of water use from currently undeveloped supplies in the Upper Colorado Basin.

Estimated mean monthly and mean annual water budgets reported in the baseline provide the best summary of potential physical limits on water supply. A more pertinent water supply estimate is one based on existing developed capacity and water rights held by the major residential areas of the Basin.

A brief summary of developed water supply and potential expanded supplies[a] are shown in Table 4.2.3.1-1 for the three largest urban places of the Basin. Table 4.2.3.1-2 shows expected levels of impact or increase in demand[b] for culinary water consistent with full development of the oil shale complex. Comparison of these annual estimates of increase in demand for culinary water with planned expansions in capacity do not reveal shortages in any of the urban places over the 20 years of the project when a new town is built outside existing water service systems. Without the new town, the planned expansion in capacity is exceeded by 1985 in Rangely. These estimates of potential water shortage may be underestimated because it is not realistic to assume that all "new capacity" is available to the increment of new population associated with the oil shale complex. However, preliminary data suggest that only 10.0 to 60.0 percent of "planned expansions" will be required without shale development. Thus additional water development may not be required with or without a new town for the population associated with the complex unless other major developments not currently envisioned should occur.

4.2.3.2 Waste Treatment. Waste water treatment capacity and planned expansions of capacity are presented in Table 4.2.3.2-1. The potential waste water treatment impact and required increase in treatment capacity, consistent with full development of the oil shale complex are roughly proportional to population increments reported for these cities in Tables 2.6-1 and 2.6-2. Without development of a new town,

---

[a]These estimates are based on existing water rights and formal contractual arrangements know to be viable at this writing (December, 1975).

[b]These estimates are not inclusive of process water required in the mining retorting and electrical power generating activities of the oil shale complex.

TABLE 4.2.3.1-1

DEVELOPED CAPACITY AND PLANNED EXPANSION OF WATER SUPPLIES IN ROOSEVELT, VERNAL AND RANGELY, 1975

Urban place	Developed capacity	Planned expansion[a]	Water rights or contract acquired for expansion
	MGD	MGD	
Roosevelt	2.5	4.3 - 5.0	Yes[b]
Vernal[c]	9.0	4.0 - 6.0	Yes[d]
Rangely	0.7	0.7[e]	Yes[f]

[a] Baseline population growth through 1990 will require approximately 10.0 percent of planned expansion in Roosevelt and Vernal and 63.0 percent in Rangely.

[b] A contract has been negotiated with the Ute Indian Tribe to develop 5 cfs for culinary purposes from Big Springs on the Uinta River. Long term water source beyond that reported above is dependent on the Central Utah Project.

[c] Vernal City water system is a part of the larger Ashley Valley system which provides culinary water to most of the Ashley Valley area. Totals reported here include the entire Ashley Valley system.

[d] Culinary supplies are being increased through the purchase of irrigation water rights in the Ashley Springs, drilling of wells and ultimately through supplies to be available via the Central Utah Project.

[e] Long term plans call for an additional expansion to 4.5 MGD with successive additions of treatment modules as required with expansion of demand.

[f] Future supplies to the extent of 4.5 MGD are available from filings on the White River.

TABLE 4.2.3.1-2

CUMULATIVE DEMAND[a] FOR CULINARY WATER WITH DEVELOPMENT OF THE WHITE RIVER SHALE COMPLEX (MGD)

Urban place	Project Year (5)		Project Year (10)		Project Year (15)	
	With new town	Without new town	With new town	Without new town	With new town	Without new town
Roosevelt	0.04	0.15	0.09	0.41	0.10	0.47
Vernal	0.09	0.38	0.22	1.02	0.25	1.19
Rangely	0.12	0.51	0.29	1.39	0.34	1.62
New Town	1.09	--	2.62	--	3.01	--

[a] An average daily use factor of 300 gallons per capita (Keith et al., 1973, and Water Resources Council, 1971) was used in developing the estimates reported above.

TABLE 4.2.3.2-1 WASTE WATER TREATMENT CAPACITY[a] AND PLANNED EXPANSION OF FACILITIES IN MAJOR URBAN PLACES

Item	Roosevelt	Vernal	Rangely
Plant type	Lagoon	Trickling Filter[b]	Lagoon
Capacity	3,600	5,000	3,800
Planned expansion	8,400[c]	30,000	6,200

[a]Capacity is reported in population equivalents unless otherwise noted.

[b]Expansion of capacity in Vernal is expected to include development of an extensive gravity bed lagoon system to the west of the city. This is but one of some 20 alternatives currently under active consideration.

[c]Design capacity of lagoon is 12,000 and 18,000 for sewer mains and interceptors. Planning efforts to date have not explicitly included porvision for demands associated with oil shale development, although baseline expansion of the population is expected to absorb from 20.0 to 50.0 percent of planned expansion in treatment capacity.

greatest impact would occur in Rangely with population increments[a] of 1,713, 4,641 and 5,396 in years 1980, 1985 and 1990. Vernal is expected to have increments of 1,257, 3,405 and 3,958 in the same years and Roosevelt 500, 1,354, and 1,574. Even without population growth beyond baseline levels each of the three urban places would require expansion of their waste water treatment facilities. Thus such an expansion should include additional capacity at least equal to the population expected with oil shale development.

4.2.3.3 Energy. The impacts on two forms of energy identified as important in the baseline are discussed here. These are electrical power and natural gas.

Projected increases in the level of demand for these electrical power products in excess of the baseline are presented in Table 4.2.3.3-1. Estimates of cost for this increment of utilities capacity are shown in Table 4.2.3.3-2.

Projected increases in the level of demand for natural gas in excess of the baseline are presented in Table 4.2.3.3-3. Estimates of cost for this increment of utilities capacity are shown in Table 4.2.3.3-4.

4.2.3.4 Other Utilities. The most significant other utility is telephone service. As noted in the baseline, all principal urban places of the Uintah Basin receive telephone service from the Bell Telephone System. Table 4.2.3.4-1 summarizes estimated number of new

[a]These estimates of population approximate population equivalent impact on waste water treatment facilities because related business and manufacturing activity are not expected to have significant impact on the system in terms of population equivalents.

TABLE 4.2.3.3-1

ANNUAL IMPACT ON ELECTRICAL UTILITIES[a] OF THE OIL SHALE COMPLEX FOR PRINCIPAL URBAN PLACES WITH A NEW TOWN[b] (KWH)

Year	Electrical Power (New Town)					
	New Town (000)	Duchesne (000)	Roosevelt (000)	Vernal (000)	Rangely (000)	Other parts of the Uintah Basin (000)
Commercial Development Stage						
1	2,265.0	22.5	75.0	187.5	255.0	37.5
2	2,265.0	22.5	75.0	187.5	255.0	37.5
3	2,212.5	22.5	67.5	172.5	232.5	30.0
4	2,370.0	22.5	82.5	202.5	262.5	30.0
Commercial--Phase I						
5	9,360.0	90.0	307.5	772.5	1,050.0	120.0
6	12,960.0	127.5	427.5	1,065.0	1,455.0	165.0
7	17,220.0	172.5	562.5	1,417.5	1,935.0	217.5
8	27,135.0	270.0	892.5	2,235.0	3,045.0	337.5
9	21,090.0	210.0	690.0	1,740.0	2,370.0	262.5
10	19,875.0	195.1	652.5	1,635.0	2,235.0	247.5
Commercial--Phase II						
15	15,960.0	232.5	772.5	1,935.0	2,632.5	292.5
20	15,960.0	232.5	772.5	1,935.0	2,632.5	292.5

[a] Demand for electrical utilities is based on 1975 annual use rates for the Utah Power and Light system in cities comparable to those found in the study area. These estimates of impact exclude electricity demands associated with commercial and industrial users.

[b] Impact on Vernal and Rangely will increase by a factor of five in the absence of a new town.

TABLE 4.2.3.3-2

CAPITAL COSTS[a] ASSOCIATED WITH ANNUAL INCREASE IN ELECTRICAL UTILITIES WITH A NEW TOWN[b]
(1975 DOLLARS IN THOUSANDS)

Year	New Town ($000)	Duchesne ($000)	Roosevelt ($000)	Vernal ($000)	Rangely ($000)	Other parts of the Uintah Basin ($000)
Commercial Development Stage						
1	271.8	2.7	9.0	22.5	30.6	4.5
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	12.6	0	0.9	1.8	0.0	0
Commercial--Phase I						
5	838.8	8.1	27.0	68.4	94.5	9.9
6	0	4.5	14.4	35.1	48.6	5.4
7	943.2	5.4	16.2	42.3	57.6	6.3
8	1,189.8	11.7	39.6	98.1	133.2	14.4
9	0	0	0	0	0	0
10	0	0	0	0	0	0
Commercial--Phase II						
15	0	0	0	0	0	0
20	0	0	0	0	0	0

[a] These estimates are exclusive of generation and main line facilities and are based on average 1975 cost experience of the Utah Power and Light Company. Average cost per hookup including transformer, conductor, breakers, poles and conduit range between 800 and 1000 dollars.

[b] Impact in Vernal and Rangely will increase by a factor of five in the absence of a new town.

TABLE 4.2.3.3-3

ANNUAL IMPACT ON NATURAL GAS UTILITIES[a] OF THE OIL SHALE COMPLEX FOR PRINCIPAL URBAN PLACES WITH A NEW TOWN[b] (CUBIC FEET IN MILLIONS)

Year	Natural Gas					
	New Town	Duchesne	Roosevelt	Vernal	Rangely	Other parts of the Uintah Basin
Commercial Development Stage						
1	54.4	0.5	1.8	4.5	6.1	0.9
2	54.4	0.5	1.8	4.5	6.1	0.9
3	53.1	0.5	1.6	4.1	5.6	0.7
4	56.8	0.5	2.0	4.9	6.3	0.7
Commercial--Phase I						
5	224.6	2.2	7.4	18.5	25.2	2.9
6	311.0	3.1	10.3	25.6	34.9	4.0
7	413.3	4.1	13.5	34.0	46.4	5.2
8	651.2	6.5	21.3	53.6	73.1	8.1
9	506.2	5.0	16.6	58.1	56.9	6.3
10	477.0	4.7	15.7	39.2	53.6	5.9
Commercial--Phase II						
15	383.0	5.6	18.5	46.4	63.2	7.0
20	383.0	5.6	18.5	46.4	63.2	7.0

[a] Estimates provided here include only that portion of gas utilities required by residential users.

[b] Impact on Vernal and Rangely will increase by a factor of five in the absence of a new town.

TABLE 4.2.3.3-4

CAPITAL COSTS[a] ASSOCIATED WITH ANNUAL INCREASE IN GAS UTILITIES WITH A NEW TOWN[b] (1975 DOLLARS IN THOUSANDS)

Year	New Town ($000)	Duchesne ($000)	Roosevelt ($000)	Vernal ($000)	Rangely ($000)	Other parts of the Uintah Basin ($000)
Commercial Development Stage						
1	362.4	3.6	12.0	30.0	40.8	6.0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	16.8	0	1.2	2.4	1.2	0
Commercial--Phase I						
5	1,118.4	10.8	36.0	91.2	126.0	13.2
6	576.0	6.0	19.2	16.8	64.8	7.2
7	681.6	7.2	21.6	56.4	76.8	8.4
8	619.2	6.0	52.8	130.8	177.6	19.2
9	0	0	0	0	0	0
10	0	0	0	0	0	0
Commercial--Phase II						
15	0	0	0	0	0	0
20	0	0	0	0	0	0

[a]These estimates of cost do not include exploration, well development, and feeder mains beyond the residential area to be added to the service system. Average cost experience of Mountain Fuel Supply Company ranging from 1,100 to 1,300 dollars per hookup were used.

[b]Impact on Vernal and Rangely will increase by a factor of five in the absence of a new town.

TABLE 4.2.3.4-1

ESTIMATED NUMBER OF NEW TELEPHONE CONNECTIONS[a] ASSOCIATED WITH DEVELOPMENT OF THE WHITE RIVER SHALE COMPLEX[b]

Urban place	With new town	Without new town[c]
Roosevelt	105	450
Vernal	250	1,130
Rangely	345	1,540
New town	3,065	--

[a] A factor of 0.98 telephone connections per new household was used in making these estimates. This factor was based on experience of the Mountain Bell Telephone Company in comparable cities in Utah.

[b] Only full development of the complex or Commercial Phase II was evaluated.

[c] Total number of new telephone connections differs with and without the new town because a greater portion of new connections are located outside major urban places without the new town.

connections[a] associated with full development of the telephone industry of the oil shale complex.

Other utilities of some importance which will receive impact are firms dealing in communication services. These include radio and television, and newspapers. It is anticipated that the increased population and economic activity generated by the oil shale complex will have a positive impact on the feasibility of existing radio, television, and newspaper operations.

4.2.4 Public Safety

Estimated impact on two elements of public safety are reviewed in this section. These include police facilities and personnel and fire facilities, personnel and services. Table 4.2.4-1 presents implied increases in demand[b] for policement and police vehicles by counties, inclusive of contained urban places, for Project Years (5), (10), and (15) under the assumption that a new town will be built. Table 4.2.4-2 presents the same information under the alternative assumption that no new town will be developed.

---

[a]Planning personnel in the Salt Lake City office of Mountain Bell are currently in the process of preparing estimates of capital cost for future development of telephone services in the study region.

[b]Estimates of demand are based on rates of 2.3 policemen and 4.0 police vehicles per 1,000 new population (Colony Development Operation, 1974).

TABLE 4.2.4-1

CUMULATIVE IMPACT[a] ON POLICE FACILITIES[b] AND PERSONNEL OF THE WHITE RIVER SHALE COMPLEX FOR SELECTED YEARS IN DUCHESNE, UINTAH AND RIO BLANCO COUNTIES WITH A NEW TOWN

Years	Duchesne		Uintah		Rio Blanco	
	Policemen	Vehicles	Policemen	Vehicles	Policemen	Vehicles
Project Year (5)	0.4	0.7	10.0	17.4	1.1	1.9
Project Year (10)	0.9	1.5	21.2	36.9	2.3	4.0
Project Year (15)	1.0	1.8	25.1	43.6	2.7	4.7

[a] Estimates of impact are based on rates of 2.3 policemen and 4.0 police vehicles per 1,000 population (Colony Development Operation, 1974).

[b] Number of vehicles required may be overestimated because of the higher utilization rates typically found in larger departments.

TABLE 4.2.4-2

CUMULATIVE IMPACT[a] ON POLICE FACILITIES[b] AND PERSONNEL OF THE WHITE RIVER SHALE COMPLEX FOR SELECTED YEARS IN DUCHESNE, UINTAH AND RIO BLANCO COUNTIES WITHOUT A NEW TOWN

Years	Duchesne		Uintah		Rio Blanco	
	Policemen	Vehicles	Policemen	Vehicles	Policemen	Vehicles
Project Year (5)	1.7	2.9	5.0	8.7	0	6.9
Project Year (10)	3.9	6.8	10.3	17.9	10.7	18.6
Project Year (15)	4.6	8.0	11.7	16.0	12.4	21.6

[a]Estimates of impact are based on rates of 2.3 policemen and 4.0 police vehicles per 1,000 population (Colony Development Operation, 1974).

[b]Number of vehicles required may be overestimated because of the higher utilization rates typically found in larger departments.

Given full development of the oil shale complex, maximum impact will occur in Uintah County if the new town is built and in Rio Blanco County if it is not. Uintah County is expected to require approximately 25 policemen and 44 police vehicles with the new development in contrast to 12 and 20 under a no new town alternative. Rio Blanco, on the other hand, shows increase in demand for policemen and vehicles at approximately 3 and 5, respectively, with a new town and 12 and 21 without it.

Tables 4.2.4-3 and 4.2.4-4 summarize essentially comparable information for fire facilities, firemen, and services. Greatest demand[a] for these elements of public safety are expected to occur in Rio Blanco County if no new town is constructed and in Uintah County if it is constructed. Review of the table suggests that the obvious possibility for meeting expanded levels of demand is not one of "going alone" because of the fractional increases in implied requirements for most fire related facilities. Because of the demonstrated scale economies associated with fire equipment facilities and firemen, major impact on these elements of public safety are probably best accommodated by some type of interlocal agreement among urban areas and counties in the provision of fire protection. The prospect exists for a substantial improvement in the fire insurance classifications within the study region.

---

[a]Estimates of demand are based on rates of 1.3 firemen, and 0.1 fire station, pumpers and trucks per 1,000 new population (Colony Development Operation, 1974).

TABLE 4.2.4-3

CUMULATIVE IMPACT[a] ON FIRE FACILITIES, PERSONNEL AND SERVICES OF THE WHITE RIVER SHALE COMPLEX FOR SELECTED YEARS IN DUCHESNE, UINTAH AND RIO BLANCO COUNTIES WITH A NEW TOWN

Years	Duchesne				Uintah				Rio Blanco			
	Fire-men	Fire stations	Pumpers	Trucks	Fire-men	Fire stations	Pumpers	Trucks	Fire-men	Fire stations	Pumpers	Trucks
Project Year (5) 0.2	*[b]	*	*	5.6	0.4	0.4	0.4	0.6	*	*	*	
Project Year (10) 0.5	*	*	*	11.8	1.0	1.0	1.0	1.3	0.1	0.1	0.1	
Project Year (15) 0.6	*	*	*	13.9	1.1	1.1	1.1	1.5	0.1	0.1	0.1	

[a] Estimates of impact are based on rates of 1.3 firemen and 0.1 fire station, pumpers and trucks per 1000 population (Colony Development Operation, 1974).

[b] An * denotes values of less than 0.1.

TABLE 4.2.4-4

CUMULATIVE IMPACT[a] ON FIRE FACILITIES, PERSONNEL AND SERVICES OF THE WHITE RIVER SHALE COMPLEX FOR SELECTED YEARS IN DUCHESNE, UINTAH AND RIO BLANCO COUNTIES WITHOUT A NEW TOWN

Years	Duchesne				Uintah				Rio Blanco			
	Fire-men	Fire stations	Pumpers	Trucks	Fire-men	Fire stations	Pumpers	Trucks	Fire-men	Fire stations	Pumpers	Trucks
Project Year (5)	0.9	0.1	0.1	0.1	3.2	0.2	0.2	0.2	2.5	0.1	0.1	0.1
Project Year (10)	2.2	0.2	0.2	0.2	5.7	0.4	0.4	0.4	5.7	0.4	0.4	0.4
Project Year (15)	2.6	0.2	0.2	0.2	6.7	0.5	0.5	0.5	6.7	0.5	0.5	0.5

[a] Estimates of impact are based on rates of 1.3 firemen and 0.1 fire station, pumpers and trucks per 1000 population (Colony Development Operation, 1974).

4.].5 Public Health Facilities and Personnel

Table 4.2.5-1 reports estimated demand for public health facilities and personnel. These estimates are based on provision of that amount of facility and/or service to maintain levels of availability as they existed in the region in 1970. Examination of the table shows greatest impact to occur in Uintah County with the development of a new town and in the Rangely area without it.

Given current levels of utilization of hospital facilities in Vernal (Uintah) and in Rangely, it appears that the impact on facilities could be handled without problem except that the full amount of unutilized capacity is not assignable to the impacts of oil shale development.[a] However, there is considerable support in the Vernal area for construction of expanded new hospital facilities because of expected growth in utilization beyond baseline levels and obsolescence of the existing facilitiy.

4.2.6 Recreation Facilities

The supply of recreation facilities found in the study region[b] and their percent of the states' supply are shown in Table 4.2.6-1. Examination of the supply side of recreation suggests a rather remarkable capacity to absorb new residents because of the relatively high levels

---

[a]Planning studies completed for the city of Vernal in 1970 indicated that hospital facilities were sufficient to service a population of 17,000. This population will not be exceeded within the life of the shale project unless significant other developments not evaluated in the baseline are initiated within the study region (Despain, 1970).

[b]Data are summarized for the three county area, Duchesne, Uintah and Daggett Counties.

TABLE 4.2.5-1

CUMULATIVE IMPACT[a] ON HEALTH FACILITIES AND MEDICAL AND DENTAL PERSONNEL OF THE WHITE RIVER SHALE DEVELOPMENT[b] WITH AND WITHOUT A NEW TOWN

Item	Duchesne		Uintah		Rangely	
	With new town	Without new town	With new town	Without new town	With new town	Without new town
No. of hospital beds	1.5	7.5	40.0	17.0	4.0	20.0
No. of physicians	1.0	1.0	5.0	3.0	1.0	3.0
No. of dentists	1.0	1.0	4.0	2.0	1.0	2.0
No. of nurses	1.0	1.0	14.0	6.0	1.5	7.0

[a]These estimates are based on maintenance of 3.7 hospital beds, 0.5 physicians, 0.4 dentists and 1.3 nurses per 1,000 population. These factors are consistent with levels of availability of these services and facilities within the Uintah Basin in 1970.

[b]Population increments associated with commercial phase II provided the basis for these estimates.

TABLE 4.2.6-1

SUPPLY OF SELECTED RECREATION FACILITIES IN DUCHESNE, UINTAH AND DAGGETT COUNTIES AND THE PERCENT OF TOTAL SUPPLY IN UTAH

Item	Occurrence in counties	Percent of State	Percent excess[a]
Population (1970)	20,649	2.0	
Water oriented recreation	345	19.7	17.7
Feature oriented recreation	132	18.2	16.2
Camping[b]	1,771	18.9	16.9
Picnicking	597	4.9	2.9
Boat launch lanes	36	20.0	18.0
Water surface (acres)	24,200	5.5	3.5
Play fields	48	7.3	5.3
Tennis courts	7	1.6	-0.4
Golf courses	2	2.1	0.1

[a]Percent excess is expressed in terms of how much recreation availability exceeds resident population percentage.

[b]Camping refers to campsites.

of availability which currently exist in the region. The impact can be considered one of quality difference at least over some range of usage until area rates of availability are approximately equal to those of the remainder of the state. Supply of recreation services exceed the study region's percentage of the state's population in all categories but tennis courts and golf courses. In at least four categories, including water-oriented recreation, total feature oriented recreation and camping and boat launches, average availability of recreation facilities are 10 times greater than for the state at large. Fortunately, capacity utilization of recreation supply is highest on those items which can be augmented with public investment.[a]

Table 4.2.6-2 reports numbers of selected recreation facilities which would be required in order not to reduce levels of availability below those which existed in 1970.

---

[a]The impact could be much more under circumstances where a prime boating surface or fragile natural area are becoming congested.

TABLE 4.2.6-2

IMPLIED IMPACT[a] ON SELECTED RECREATION FACILITIES IN THE STUDY REGION OF THE WHITE RIVER SHALE DEVELOPMENT

Feature oriented activities[b]	Impact[c]
Camping	1,078
Picnicking	364
Boat launch lanes	21
Play fields	29
Tennis courts	4
Golf courses	1

[a] These estimates reflect maintenance of 1970 levels of availability as reported by Utah Department of Natural Resources, 1971.

[b] This selection reflects the fact that their supply is responsive to management and public investment.

[c] Impact is number of new activity sites required to maintain 1970 levels of availability with the addition of population associated with the White River Shale Development Complex.

5.0 SOCIO-CULTURAL IMPACTS

This chapter will discuss the results of a survey designed to assess the attitudes of study area residents toward oil shale development and the impacts of this development on the area's rural lifestyle. The chapter will also consider possible impacts of development on the Ute Indian population and the area's archaeological and historical sites.

5.1 Results of "Survey 1975"

5.1.1 Description of Survey and Methods of Analysis

To determine the possible effects of oil shale development on the population centers of the study region, a public opinion survey was conducted by Opinion Sampling Research Institute. The population centers selected for the survey were Vernal, Roosevelt, and Rangely. The questionnaire, along with a discussion of mechanics of drawing the sample, conducting the interviews, and analyzing the results are discussed in Appendix C (the Opinion Sampling Research Institute Report). Selected results of the survey will be included in this section. They will be reported in tables along with the sampling error at the 95 percent confidence level.

Several demographic subgroups were considered in the analysis of the survey results. The two important ones were:

A) Mormons and others, and

B) New residents and established residents.

A respondent was classified as "Mormon" if he reported that he attends a Mormon church "always" or "sometimes." "New resident" was defined as one who has lived in his community five years or less.

As a guide in interpreting responses to the survey instrument, ten community leaders were personally interviewed. These individuals were asked to respond to the same survey instrument used in the survey. Their responses coincided closely with the majority of the respondents. The community leaders were also asked specific questions relating to meanings and issues in the survey instrument.

Factor analysis was used to identify inter-relationships among responses to questions. Two independent factors were extracted using this procedure: an "economic growth" factor and a "rural lifestyle" factor. Demographic subgroups were then characterized using these factors. For this procedure, eight variables were used corresponding to eight survey questions. The methodology and theory involved in this procedure are reviewed in Appendix C.

5.1.2 Attitudes of Vernal, Roosevelt, and Rangely Residents Toward Oil Shale Development

The survey instrument contained four questions directly related to oil shale development. A filter question was first asked to determine whether the residents of the sample area had heard of the White River Shale Project. Three-fourths of the population had heard of

this organization. Oil shale development was supported by eight persons in ten (see Table 5.1.2-1) with just five percent disapproving. None of those surveyed in Roosevelt disapproved. By comparison, nine percent disapproved in Rangely and seven percent in Vernal. A possible explanation for this difference is that Roosevelt residents feel they will be indirectly impacted while Vernal and Rangely residents anticipate more of a direct impact. When asked the question why they approved or disapproved of oil shale development in the study region, several general patterns of answers emerged. A representative sampling of answers follows:

Approval:

"Bring in more jobs."

"It will keep my business here longer and create jobs."

"Make community more stable."

"We need to be independent of foreign energy sources."

"Helps energy shortage."

Conditional Approval:

"If it doesn't take anyone's water rights."

"If they manage it correctly, maintain beauty of the Basin."

Disapproval:

"It will ruin our town as far as I'm concerned, too much riff-raff comes in. I hope it will never happen, but others need it, I suppose."

"It will amount to uncontrolled growth--need a lot of planning and money."

It is interesting to note that of those approving oil shale development in the region, approximately 60 percent saw the development as stimulating

TABLE 5.1.2-1

SUMMARY OF RESPONSES TO SURVEY QUESTION: DO YOU APPROVE OR DISAPPROVE OF OIL SHALE DEVELOPMENT IN THE UINTAH BASIN?

	Approve[a] Percent	Disapprove[a] Percent	Don't know Percent
Total	83 (± 5)	5 (± 3)	12 (± 4)
Area:			
Rangely	73 (± 8)	9 (± 5)	18 (± 7)
Roosevelt	89 (± 6)	0 (± 0)	11 (± 6)
Vernal	82 (± 8)	7 (± 5)	11 (± 6)

[a]Response differences that are significant at the .05 level.

the local economy while approximately 40 percent viewed the development as an important factor in increasing the domestic energy supply.

The respondents were then asked how oil shale development could best be undertaken so as to have a positive impact on their community. The following were representative answers:

"Open jobs to Uintah Basin residents before bringing other people in."

"Develop with care without destroying beauty and countryside."

"Slow and do it right the first time so as to have less shock to the area."

"If new cultural and social ideas were brought into the area and improvements in water and sewer were made."

"Get it organized and underway, it may help energy shortage."

"Educate the people to the problems that may occur, do studies to show where people ought to live, commercially locate businesses, get people to discuss the problems."

"Start a completely different town for people working."

"Have refineries here to refine it."

"Try to maintain rural area and keep industrial development out of the cities."

To contrast the attitudes of new and established residents toward development-induced changes in the study region, the following question was asked: Do you feel large increases in the non-Mormon population would have a positive or negative influence on the character of the community? As Table 5.1.2-2 indicates, twice as many new residents than established residents viewed non-Mormon population increases as positive. However, over 50 percent of the established residents felt that a large increase in the non-Mormon population would have either no effect or a positive effect on the character of their communities;

TABLE 5.1.2-2 SUMMARY OF RESPONSES TO THE QUESTION: DO YOU FEEL LARGE INCREASES IN THE POPULATION WOULD HAVE A POSITIVE OR NEGATIVE INFLUENCE ON THE CHARACTER OF THE COMMUNITY?

	Positive[a] Percent	Negative Percent	No effect Percent	Undecided Percent
Total	31 (± 7)	16 (± 5)	30 (± 7)	23 (± 6)
Established residents	21 (± 8)	22 (± 8)	32 (± 9)	25 (± 8)
New residents	42 (± 11)	9 (± 6)	30 (± 10)	19 (± 9)

[a]Response differences significant at the .05 level.

only 22 percent viewed this change as negative. In contrast, nearly three-fourths of new residents felt that a large non-Mormon population increase would have either a positive effect or no effect; only nine percent of this group saw the influx of non-Mormons as negative. As revealed from comments given in an open-ended part of this question, those that viewed non-Mormon population increases as negative tend to do so because they fear a dilution or weakening of community standards; those that recorded a "positive" response see this change as increasing the variety of viewpoints and tolerance in the community, and to a lesser extent a weakening of what is perceived as Mormon dominance in education, government, and commercial enterprise.

5.1.3 Impact of Oil Shale Development on Rural Life Style

The Baseline (Phase I) Report noted that the survey conducted in 1974 by the Department of Economics at Utah State University revealed that the residents of Vernal and Roosevelt both value two seemingly antithetical values: economic growth and rural lifestyle. Since it appeared that an important trade-off is involved here, an effort was made in Survey 1975 and related personal interviews of community leaders to explore the meaning of these values, their relative importance for selected groups, and the ways in which they might be impacted by oil shale development. Accordingly, various questions dealing with the subject were included in Survey 1975.

The factor analysis scales previously mentioned allow for a good summarization of the relative importance of rural life and economic

development for the various demographic sub-groups in the study region. As can be seen in Table 5.1.3-1 new residents have the strongest feeling concerning economic development and active Mormons and established residents have the strongest for their rural lifestyle. However, it should be noted that both goals were considered important by the vast majority of residents.

In interviews with community leaders, each leader was asked to define the terms "rural life" and "economic growth." It became evident that for the area's "established" residents, the former term primarily stands for a lifestyle or way of life. While most of the respondents defined the term, in part, in physico-geographical terms (e.g. "remoteness from large population centers," "not having overcrowding and too many people"), emphasis was placed on two kinds of socio-cultural features, namely traits of character and features of community organization. Among the character traits frequently mentioned were industriousness, independence, and self-reliance. The social features emphasized were community solidarity and cohesion, citizen participation in a wide variety of community activities and institutions, and opportunity for well-rounded and balanced character development. All of these features are highly valued and associated with "rural living." As the following points out, these features were generally not viewed as antithetical to economic growth and development.

Roosevelt and Vernal have experienced significant growth since 1970. During the five year period, Roosevelt's population has increased approximately 3,000 and Vernal's 2,000. Growth in Rangely has been less spectacular. When reactions to this growth were solicited, eight

TABLE 5.1.3-1 AVERAGE VALUES FOR THE FACTOR ANALYSIS SCALES OF ECONOMIC GROWTH AND RURAL CHARACTER (UNITLESS)

	Economic growth factor[a]	Rural character factor[b]
New Residents	85 ± 3	53 ± 5
Established Residents	76 ± 4	63 ± 3
Active Mormons	80 ± 3	64 ± 3
Others	78 ± 4	54 ± 4

[a] New Resident-Established Resident score differences significant at the .05 level.

[b] New Resident-Established Resident score differences significant at the .05 level, and Active Mormon-Others score differences significant at the .05 level.

of ten respondents viewed this change favorably. Nearly all new residents favored the expanding activities and almost three-fourths of the established residents registered a favorable attitude.

Thus, Survey 1975 confirmed the preliminary conclusion of the Utah State University Economics Department Survey that residents of the Uintah Basin's population centers strongly favor both economic growth and a rural lifestyle.

To test the depth of feeling of residents concerning the area's expanding economy and population, residents were asked if they favor or oppose an increase in population if it causes local taxes to rise. Even with a moderate increase, the majority of people favor growing communities. Table 5.1.3-2 details the responses.

To explore the relations between these two values, the respondents were next asked if they felt their community could undergo economic growth and still maintain its rural character. Two-thirds of the respondents answered "yes." The interviews with community leaders strongly reinforced this point of view. When pressed for an explanation, all or most of the community leaders commented that economic growth, far from competing with or undermining the socio-cultural features which define "rural life" is a necessary condition for their maintenance and promotion. The following comments were made in discussing this point: "Economic growth brings new blood and vitality to the community." "Growth is a stimulator." "Growth is the antidote to stagnation." "A sense of growth and progress is essential." The character traits of industriousness, resourcefulness, and self-reliance flourish in a

TABLE 5.1.3-2

SUMMARY RESPONSES TO SURVEY QUESTION: DO YOU FAVOR OR OPPOSE AN INCREASE IN POPULATION IN YOUR COMMUNITY IF IT CAUSES LOCAL TAXES TO RISE MODERATELY?

	Favor Percent	Oppose Percent	Undecided Percent
Total	55 (± 6)	33 (± 6)	12 (± 4)
Area:			
Rangely	61 (± 9)	24 (± 3)	15 (± 7)
Roosevelt	50 (±10)	41 (±10)	9 (± 6)
Vernal	56 (±10)	31 (± 9)	13 (± 7)
Age:			
Under 30	54 (±12)	34 (±11)	12 (± 7)
30-44	63 (±11)	23 (± 9)	14 (± 8)
Over 45	46 (±11)	44 (±11)	10 (± 7)
Time in Community:			
New Residents	66 (±11)	24 (±10)	10 (± 7)
Established Residents	49 (± 8)	39 (± 8)	13 (± 5)
Income:			
Under $8000	43 (±15)	40 (±15)	17 (±11)
$8000-$15000	54 (± 9)	37 (± 9)	9 (± 5)
Over $15000	70 (±12)	20 (±10)	10 (± 8)

developing economy, the leaders urged, and so also do such community features as citizen participation, diverse opportunities and community cohesion.

Even though a perceived compatibility exists, when residents were asked to choose between economic growth or preserving the rural character of the community, 58 percent chose economic growth. Roosevelt was the only community in which a majority of the respondents did not desire economic development at the expense of the town's rural character. A slight plurality, however, did indicate they preferred economic growth (see Table 5.1.3-3).

In interpreting the response to this last question, it is important to bear in mind the widespread belief in the region that continuing economic growth is necessary for the maintenance of prized features of the traditional lifestyle. While rapid and continuous growth over a long period of time might eventuate in large populations and "big city" problems, it appears that most of the area's residents do not fear this prospect. Apparently they do not think that the area will grow "too fast" or become "too big." One of the community leaders living in Roosevelt expressed the belief that Roosevelt could grow to a population of 25,000 and still remain rural. Another community leader in Vernal thought that Vernal's population could expand to 50,000 without disastrous impact on this value. In this connection, it should also be mentioned that several of the community leaders stressed the need for zoning or other land use controls as a means of preserving the spatial element (low density) associated with rural life.

TABLE 5.1.3-3

SUMMARY OF RESPONSES TO SURVEY QUESTION: IF YOU HAD TO CHOOSE BETWEEN THE FOLLOWING TWO ALTERNATIVES, WHICH WOULD YOU PREFER: ECONOMIC GROWTH OR PRESERVING THE RURAL CHARACTER OF THE COMMUNITY?

	Economic Growth[a] Percent	Rural Character[a] Percent	Undecided Percent
Total	58 (± 6)	31 (± 6)	11 (± 4)
Area:			
Rangely	61 (± 9)	27 (± 8)	12 (± 6)
Roosevelt	47 (±10)	41 (±10)	12 (± 6)
Vernal	63 (±10)	26 (± 9)	11 (± 6)
Time in Community:			
New Residents	72 (±10)	21 (± 9)	7 (± 5)
Established Residents	50 (± 8)	36 (± 7)	14 (± 6)
Religion:			
Active Mormon	53 (± 9)	38 (± 9)	9 (± 5)
Other	65 (± 9)	23 (± 7)	12 (± 6)

[a] Response differences significant at the .05 level.

5.2 Oil Shale Development and Ute Impacts

Extensive oil shale development on the federal tracts adjacent to Ute lands would have a significant impact on the Ute people and lands. Gilbert White and Gottfried Lang (1975) offer some useful concepts for assessing the potential degree of this impact. They argue that rural communities are disadvantaged in coping with rapid growth and development to the extent that they exhibit a lack of "structural differentiation" and "linkages" with other communities and institutions. The structural differentiation or institutional complexity of a community is measured by the number and kinds of institutions, i.e., the number of schools, retail and wholesale establishments, recreational establishments, churches, associations, government offices, and planning services. A community's linkages or organized activities connecting that community to others are measured by the number and kinds of economic, political, and informational transactions which occur as well as the use people make of inter-community transportation facilities.

White and Lang contend that prior to 1950 the Northern Ute Tribe exhibited a low level of structural differentiation and few structural linkages, but that since this time the tribe has become a more highly differentiated and strongly linked community. In their words (1975:78):

> ...But note that the Northern Ute tribe which fits this description in the early 1950's has changed during the following 15 years so that as a result of increasing linkages (University of Utah training programs among others) it has also increased its structural differentiation. The Uintah reservation appears to be better organized, more productive, and self-esteem has risen.

The implication to be drawn from this is that the Utes are in a more

advantaged position than previously to withstand, and perhaps to gain, from oil shale development. This implication is evidenced by the establishment of several Tribal Enterprises, including the Bottle Hollow Resort Complex and Convention Center, the Ute Scientific Laboratory, Ute Fabrication, and the Livestock Enterprise; various community projects; and profitable arrangements through which Ute water is leased to non-Ute water users on a deferred use basis. In developing these projects and negotiating arrangements, the Utes have enlisted the support of qualified technical assistance (e.g. a resource director, legal counsel, business managers, university-based research and extension activities). Relationships with the Bureau of Indian Affairs appear to be constructive and congenial, and the Business Committee, the official tribal government, is making a concerted attempt to develop a planning capability for ensuring that tribal goals and objectives will be achieved in the longer term. In this connection, the Business Committee and technical staff have initiated studies to examine how operating and planned energy development projects in the Uintah Basin and various possibilities for the utilization of Ute resources (water, land, manpower, capital) in these developments will affect the achievement of Ute tribal goals.

5.3 Archeological, Historical, and Selected Other Land Use Impacts

In any assessment of indirect impacts there are two important variables: time and population. Even without an increase in population the archeological, historical, paleontological, and other miscellaneous sites would be subjected to deleterious activities like vandalism and scavangering. However, with an increase in population there is an increased probability that these sites will be negatively impacted for a given time span. All impact assessments in this section will be based on the premise that the time span is a constant.

A gravity model[a] was used to predict the impact of increased population on selected archeological, historical, paleontological, geological, and off-road vehicle sites in the review. Table 5.3-1 shows the change in the gravity index as a result of a population increase caused by oil shale development. Two sets of indices are computed. The first is for the "no new town" alternative; the second is for the remote "new town" alternative. The sites with largest increase in index will be the most likely to be impacted. All population figures are taken from section 2.6 of this report.

---

[a]The model used was of the form $\Delta G_i = \Delta P_i/(\Sigma W_i D_i)^2$ where G, P, D, and W represent the gravity index, population of city nearest to site, road distance between site and city, and road weighting factor. The weighting factor is either 1(55/55) for paved roads or 2.2(55/25) for gravel roads. Fifty-five equals optimal speed and 25 equals recommended speed for gravel roads.

TABLE 5.3-1 GRAVITY INDEX INCREASES FOR HISTORICAL AND ARCHAEOLOGICAL SITES

Sites	City	Population increase alternative[a] 1	2	$(\Sigma D_i W_i)$	Increase in gravity index[a] 1	2
Archeological						
Nine Mile Canyon	Roosevelt	1,710	353	5,776	.30	.06
Caldwell Village	Roosevelt	1,710	353	346	4.96	1.02
	Vernal	4,299	889	493	8.72	1.80
Dry Fork	Vernal	4,299	889	100	42.99	8.89
Peltier Ranch	Vernal	4,299	889	49	87.73	18.14
McKee Springs	Vernal	4,299	889	1,460	2.95	.61
Jones Creek	Vernal	4,299	889	2,209	1.95	.40
Cub Creek	Vernal	4,299	889	605	7.11	1.47
Historical						
Alhandra Stage Stop	Vernal	4,299	889	1,156	3.72	.77
Smith Well Stage Stop	Roosevelt	1,710	353	4,115	.42	.09
Ignatio Stage Stop	New Town	0	10,028	400	0	25.07
Dragon, Rainbow	New Town	0	10,028	3,906	0	2.57
Paleontological						
White River Pocket	New Town	0	10,028	3,906	0	2.57
Stripping Quarry	New Town	0	10,028	2,500	0	4.01
Geological						
Devil's Rock House	New Town	0	10,028	1,406	0	7.13
Upper Yellowstone Creek	Vernal	4,299	889	6,400	.67	.14
Off-road Vehicle						
Jensen	Vernal	4,299	889	100	42.99	8.89
U.S. 40	Vernal	4,299	889	25	171.96	35.56
Steinaker Reservoir	Vernal	4,299	889	25	171.96	35.56

[a]Key: 1 = No New Town
2 = Remote New Town

5.3.1 Archeological and Historical Impacts

According to the Division of State History report entitled A Sketch of Western Uintah Basin Prehistory, there are 432 recorded archeological sites in the study region. Most of these are in Uintah and Duchesne counties. Twenty-eight are located on or adjacent to oil shale tracts U-a and U-b. The known sites are geographically distributed into discrete clusters. There are vast areas in which there are no known sites. This inaccurate picture of aboriginal settlement in the study region is primarily a function of the inherently "spotty" nature of archeological investigations which have historically been dependent on contract and salvage funding.

The job of predicting possible impacts on archeological sites in the study region is difficult. There is not only a large number of sites but also a huge potential for further study.

A letter was written to the Division of State History asking for assistance in predicting possible indirect impacts of oil shale development on the region's archeological and historical sites. In reply, this Division stated in a letter dated August 14, 1975:

> ... in our opinion the results of increased population and energy related activities in the Uintah Basin are necessarily involving a major impact on both known and potential historic and archeological sites in that area. Simply, the increase in population means there will be increased possibility for vandalism, pot hunting and other deleterious activities.

As previously mentioned vandalism and other deleterious activities will occur whether or not oil shale development comes to the region. However, with an increase in population will come an increased potential for such activities.

Obviously it is not feasible to include all known archeological sites and all present and potential historical monuments in the previously mentioned gravity model. To delineate those of interest, it was decided to use those with high visibility (those sites listed in the National and State Register of Historic Places) and those near the oil shale tracts.

As can be derived from Table 5.1-3, the Peltier Ranch and Dry Fork petroglyphs are the most likely archeological sites to be indirectly impacted by oil shale development. The McKee Springs, Cub Creek, and Jones Creek sites are all located in or adjacent to Dinosaur National Monument.

Also included in Table 5.3-1 are several historic sites. All are ruins so their problems are similar to those involved in archeological sites. Except for the Smith Wells Stage Stop all were involved with the operation of the Uintah Railway and/or past gilsonite mining operations. The Ignatio Stage Stop is located near the site of the remote "new town." Approximately 25 miles south of the oil shale tracts are two abandoned gilsonite mining towns, Dragon and Rainbow. While these "ghost towns" have very few remaining above ground structures, they do have unfenced open slot abandoned mines which are several hundred feet deep. These constitute a major safety hazard. Should a community be developed at the oil shale tract these abandoned mines could constitute a problem. The rest of the historic monuments in the region are located inside communities. The impact of increased population on these sites is largely dependent on community planning and procedures taken to protect them.

5.3.2 Paleontological, Geological, and Off-Road Vehicle Sites

The study region has had several important paleontological sites (Uinta Eocene). Two are listed in Table 5.3-1. Both carried fossil remains of a variety of vertibrates. However, they have been thoroughly exploited and according to G. E. Untermann, former Director of the Utah Field House of Natural History in Vernal, it is unlikely that these sites would be negatively impacted by an increased population.[a]

The area north of the oil shale tracts is known as the Devil's Playground and contains colorful examples of Badlands type erosion. Of particular note is an area known as the Devil's Rock House. This is a 60 acre area containing spectacular but fragile geological formations. Because of the area's proximity to the oil shale lease tracts this site could be affected if a "new town" is constructed near Bonanza (see Table 5.3-1). Another important geological area is located on Upper Yellowstone Creek. Its formations are similar to those at Bryce National Park but are on a much smaller scale. Because of its distance from population centers the Yellowstone Creek site will probably not be affected by population increases.

The whole question of off-road vehicle use and the ability of federal regulatory agencies to control their use on federal lands is currently in the courts. The Bureau of Land Management (BLM) wants to

---

[a]Mr. Untermann was interviewed on 3 November 1975, approximately one week prior to his death. He expressed at that time a strong desire to be quoted in this regard.

restrict off-road vehicle use in the Devil's Rock House area. Several important off-road vehicle use areas around Vernal have been identified by the BLM. As can be seen in Table 5.3-1 they could all experience substantial increased use with an increase in population.

5.4 Oil Shale Development and Selected Demographic Trends

Table 5.4-1 shows population projections by counties for the oil shale scenario "without" and "with" a new town. The projections were obtained by taking the Utah Process baseline projections and allocating these to the counties of Duchesne, Uintah, and Rio Blanco using a ratio derived from 1970 census data. They were adjusted to take into account oil shale related growth by adding to the baseline figures the projections obtained from the gravity model discussed in Section 2.6.

Table 5.4-1 shows population projections for the three counties for the years 1975, 1980, 1985, and 1990 assuming that a new town will not be developed. During this period of time, the population of Duchesne County is expected to increase by more than 2,000 (a 14 percent increase); that of Uintah County by more than 5,000 (a 28 percent increase); and that of Rio Blanco County by approximately 5,500 (a 41 percent increase). In each county, the most rapid increase is likely to occur between 1975 and 1980. Whereas for Duchesne and Uintah Counties the population is likely to decrease slightly between 1985 and 1990, the population of Rio Blanco County is expected to experience a continuing increase during this period.

Table 5.4-1 also shows the population projections for the three counties assuming that a new town will be built. Since the new town would be located in Uintah County, this county would, of course, experience the greatest population growth (a 59 percent increase

TABLE 5.4-1 POPULATION PROJECTIONS BY COUNTIES FOR THE OIL SHALE SCENARIO[a]

County	Year			
	1975	1980	1985	1990
	Without a New Town			
Duchesne	15,130	16,967	17,478	17,275
Uintah	18,713	22,351	24,101	23,920
Rio Blanco	5,972	8,187	10,758	11,401
	With a New Town			
Duchesne	15,130	16,469	16,058	15,647
Uintah	18,713	24,159	29,257	29,825
Rio Blanco	5,972	6,844	7,031	7,124

[a] Baseline county figures plus gravity model allocations equal county population projections.

between 1975 and 1990, as compared to that of 3 percent for Duchesne County and 19 percent for Rio Blanco County).

Table 5.4-2 predicts age distributions of the study region population under the "without" and "with" oil shale development.[a] The "without" alternative in Table 5.4-2 assumes the proportions incorporated in the Utah Process baseline and the "with" alternative uses proportions obtained from the Utah Process Oil Shale Future. Only marginal differences are noted with the major exception that with oil shale development, the 20-34 age group experiences a relatively large increase, whereas under the "without" oil shale development alternative this age group shows a steady decline after 1980. Thus oil shale development may briefly revitalize this age group in the sense discussed above under community attitudes.

---

[a]Oil shale development considered in these projections include only those envisioned by the White River Shale Project.

TABLE 5.4-2 PREDICTED AGE DISTRIBUTION OF THE POPULATION WITHIN THE STUDY AREA

Age categories	Year 1975	1980	1985	1990
Without Oil Shale Development				
Males				
0-19	8,321	8,372	7,791	7,131
20-34	5,494	6,397	5,554	4,046
35-64	4,977	5,367	6,009	7,412
65+	1,274	1,417	1,409	1,402
Females				
0-19	7,923	8,072	7,625	7,131
20-34	5,614	6,354	5,388	4,167
35-64	4,818	5,324	5,968	7,011
65+	1,354	1,631	1,699	1,763
With Oil Shale Development				
Males				
0-19	8,321	9,168	9,735	9,520
20-34	5,494	7,505	7,903	5,996
35-64	4,977	5,701	7,013	9,152
65+	1,274	1,520	1,622	1,630
Females				
0-19	7,923	8,788	9,421	9,362
20-34	5,614	7,458	7,694	6,049
35-64	4,818	5,653	7,013	8,836
65+	1,354	1,710	1,936	2,051

SOURCE: Age distribution proportions are taken from State UPED Model.

5.5 Oil Shale Development and Crime Projections

With the increase in population in the study area over the last five years there has been an accompanying increase in crime. As Table 5.5-1 shows, three major categories of crime increased at a faster rate between 1972 and 1974 than did the population rate for this same period of time. Thus it appears that for a given incremental increase in population, crime increases at a disproportionately large increment. Such a conclusion can in part be substantiated by examining other energy impacted areas. Rock Springs found that police calls during its rapid growth period increased at a much faster rate than did the population.

With increase of population it would be expected that a linear extrapolation of crime would be inadequate in light of the discussion of the previous paragraph. As a variety of people are attracted to the area (especially non-Mormon), it is expected that certain offenses will increase faster than others. For example, alcohol related offenses would be expected to rise significantly.

TABLE 5.5-1 POPULATION FIGURES AND THE FREQUENCY OF ARRESTS FOR SERIOUS CRIME IN THE STUDY AREA

	Year		Percent Increase
	1972	1974	
Population	29,684	34,524	16
Larceny (< $50)	85	116	36
Larceny (> $50)	57	74	30
Burglary	58	68	17

SOURCE: Crime figures furnished by UBAG.

6.0 NATIONAL ECONOMIC IMPACTS OF OIL SHALE DEVELOPMENT

The development of a commercial size oil shale complex in the study region would have two primary impacts on the domestic economy:

A) It would have a significant positive impact on total employment and income; these impacts will be largely confined to the Uintah Basin region, and have been outlined in Chapter 2.0. Given that the nation's economy is currently experiencing its worst postwar recession and that the unemployment rate is expected to remain high through the remainder of the decade, the proposed action takes on additional significance.

B) The additional domestic production from shale would offset the need for an equivalent volume of imported oil. At the current world price of imported oil, about $11.50 per barrel,[a] the reduced need for foreign oil would result in an improvement in the nation's trade balance and balance of payments. This impact is outlined in detail below.

Because of the nation's increasing reliance on foreign sources of crude oil and the threat of another oil embargo as a result of political or economic differences between the United States and other producing countries, additional domestic producing capacity is an important strategic consideration. As shown in Table 6.0-1, domestic demand for petroleum products increased steadily from 1963 through 1973 at an average rate of 4.5 percent per annum. (The decline in demand in 1974

[a] Based on the official price of the OPEC cartel.

TABLE 6.0-1

DOMESTIC PRODUCT DEMAND AND IMPORTS OF PETROLEUM (THOUSANDS OF BARRELS PER DAY)

Year	Domestic product demand	Imports			Total imports a percent of demand
		Crude	Refined products	Total	
1963	10,743	1,131	992	2,123	19.8
1964	11,023	1,198	1,060	2,258	20.5
1965	11,513	1,238	1,230	2,468	21.4
1966	12,085	1,225	1,348	2,573	21.3
1967	12,566	1,128	1,409	2,537	20.2
1968	13,393	1,290	1,550	2,846	21.2
1969	14,137	1,409	1,757	3,166	22.4
1970	14,697	1,324	2,095	3,419	23.3
1971	15,213	1,680	2,245	3,925	25.8
1972	16,354	2,216	2,525	4,741	29.0
1973	17,400	3,286	2,498	5,784	33.0
1974	16,700	4,049	2,892	6,941	42.0

SOURCE: U.S. Bureau of Mines, 1974.
Oil and Gas Journal, 1975.

was the result of the Arab embargo, substantially higher product prices, and the economic recession.) Domestic production, however, has not kept pace as imports increased from 20 percent of demand in 1963 to 42 percent in 1974. Preliminary data for the first half of 1975 indicate even greater reliance on foreign oil, partially the result of a combination of price controls on part of domestic production and a crude oil allocation scheme that result in an implicit subsidy of about $3.00 per barrel of imported oil.

With four of every ten barrels of oil consumed presently coming from foreign sources, the effect of another embargo by the OPEC cartel could be disastrous for the nation's economy. It is also clear that our national defense position is weakened by this increased reliance on non-secure sources. Strategic consideration alone suggests that significant expansion of the nation's crude producing capacity is essential.

The potential impact on the United States foreign trade and payments balance is also easy to document. The data on international trade and payments (Table 6.0-2) show that although the United States has typically had a favorable trade balance (i.e., exports of goods and services in excess of imports), but the balance of payments which includes capital flows, loans, and government grants, has suffered from chronic deficits since 1950. Since 1970 these deficits have been extremely large, especially the $24 billion deficit in 1971 which precipitated the radical change in the world monetary system including the adoption of a system of essentially free floating exchange rates.

TABLE 6.0-2

SUMMARY OF U.S. FOREIGN TRADE AND BALANCE OF PAYMENTS, 1950-1974 (MILLIONS)

Year	Foreign Trade--Goods and Services			Balance of payments[b]
	Exports	Imports	Surplus[a]	
1950	--	--	--	-3,489
1955	--	--	--	-1,242
1960	30,446	23,364	7,082	-3,711
1965	42,177	32,277	9,900	-1,335
1967	51,495	41,007	10,488	-3,544
1968	61,511	48,134	13,377	172
1969	61,712	53,589	8,123	-6,958
1970	69,682	59,311	10,371	-4,721
1971	69,770	65,231	4,539	-23,977
1972	77,400	83,400	-6,000	-14,566
1973	100,400	96,100	4,300	-7,606
1974	140,200	138,100	2,100	-18,338

[a] Exports minus imports.

[b] This balance is shown on the "liquidity basis" which is measured by changes in U.S. monetary reserve assets and in U.S. liquid liabilities to all foreigners.

SOURCE: U.S. Bureau of the Census, 1974.
Board of Governors of the Federal Reserve System, 1975.
U.S. Department of Commerce, 1975.

Imports of foreign petroleum and products averaged 6.9 million barrels per day in 1974 or an annual total of about 2.5 billion barrels. At an average price of $11.50 per barrel, this implies a net negative contribution of about $28.8 billion to both the trade and payments balances. Assuming that production from the proposed complex essentially offsets the demand for an equivalent amount of foreign oil[a] and that current prices are maintained, the various stages of production at the White River complex would make positive contributions to the domestic trade and payments accounts as shown in Table 6.0-3. At full commercial stage production of 100,000 bpd, the complex could mean an improvement in the trade balance of almost $420 million.

To be sure, the proposed shale oil development by itself will not solve the domestic foreign trade or strategic dependence problems of the United States. But this, together with other energy developments, could, over the next ten years, significantly reduce the magnitude of those problems.

Impacts on the state economy are also significant; these are summarized in Table 6.0-4. The total employment increase of 5,750 (2,300 in the oil shale complex and 3,450 in indirect activities) will improve overall employment conditions in the state. Some workers both in the study region and in other parts of Utah who would otherwise have have been unemployed will flow into these newly created jobs. This

[a]Under competitive conditions where increased supply would tend to lower price and increase the total quantity demanded, the increased domestic production could not be assumed to offset an equal amount of imports. Because the current world oil price is not being determined by competitive factors, the assumed substitution of domestic for imported product is not unreasonable.

will reduce the state unemployment rate and also state spending for various types of income maintenance programs (e.g., unemployment compensation). By year (15), total income generated will be more than $100 million annually both from the oil shale complex and indirect sources. Revenues from income, property, and sales taxes will exceed $31 million in year (15) as a result of the direct and indirect effects of the proposed project.

TABLE 6.0-3 FOREIGN TRADE IMPLICATIONS OF THE PROPOSED WHITE RIVER OIL SHALE COMPLEX

Stage	Production barrels per day	Annual net impact on foreign trade and payments balance[a] (millions)
Commercial Development Stage	14,000	$58.8
Commercial--Phase I	50,000	209.9
Commercial--Phase II	100,000	419.8

[a]Assumes a price of $11.50 per barrel for imported oil.

Table 6.0-4 Summary of Economic Impacts on Regional and State Economy, Year (15)

Employment:		
Direct	2,300	
Indirect	3,450	
TOTAL		5,750
Wage Income (millions):		
Direct	$48.8	
Indirect	51.8	
TOTAL		$100.6
State and Local Tax Revenues (millions):		
State Income Tax Oil Shale Complex	$12.0	
State Income Tax Individuals	1.5	
Ad Valorem Property Tax	15.0	
Other Property Taxes	1.6	
General Sales Tax	1.3	
TOTAL		$31.4

BIBLIOGRAPHY

1. American City. 1960. How IBM Came to Rochester, Minnesota. November.

2. Barasch, Stephen B. 1974. Recreational Planning for New Communities. Exposition Press (New York).

3. Bartholomew, Harland. 1965. Land-use in American Cities. Harvard University Press. (Cambridge, Mass.)

4. Berry, Michael S. 1975. A Sketch of Western Uintah Basin Prehistory. (Division of State History) May.

5. Board of Governors of the Federal Reserve System. 1975. Federal Reserve Bulletin. Vol. 61:5. May.

6. Booz, Allen S. Hamilton, Inc. 1974. A Procedures Manual for Assessing the Socio-Economic Impact of the Construction and Operation of Coal Utilization Facilities in the Old West Region, Special Report prepared for the Old West Regional Commission. (Washington, D.C.) June 18.

7. Breese, Gerald et al. 1965. The Impact of Large Installations on Nearby Areas: Accelerated Urban Growth. Sage Publications (Los Angeles).

8. Call Engineering, Inc. 1975. Marketability, Economic Feasibility and Socio-Economic Impact of Proposed Kaiparowits New Town, Kane County, Utah. Salt Lake City, UT March.

9. Chamber of Commerce of the United States. 1973. What New Jobs Mean to a Community. (Washington, D.C.)

10. Claire, William H. (ed.) 1973. Handbook on Urban Planning. Van Nostrand Reinhold Company (New York)

11. Clapp, James A. 1971. New Towns and Urban Policy: Planning Metropolitan Growth. Dunellen (New York)

12. Colony Development Operation. 1974. An Environmental Impact Analysis for a Shale Oil Complex at Parachute Creek, Colorado. Vol 3: Parts 3 and 4. Denver.

13. Dale Despain & Associates. 1970. Comprehensive Plan for Vernal City, Utah. Special Report Prepared for Uintah County and Vernal City. July.

14. Derthick, Martha. 1972. New Towns in Town. The Urban Institute (Washington, D.C.)

15. Gilmore, J. S. and M. K. Duff. 1973. The Oil Shale Regional Economic Base Working Paper No. 1 for the Oil Shale Regional Planning Commission. (Rifle, Colorado)

16. Hildebrand, George H. and Arthur Mace, Jr. 1950. The Employment Multiplier in an Expanding Industrial Market: Los Angeles County, 1940-1947. Review of Economics and Statistics. Vol. 32: 141-149.

17. Johnsen, Lyle G. 1975. "Estimation of Public Service Cost Functions in Non-Metropolitan Utah Counties" Unpublished MS thesis. Department of Economics, Utah State University. Logan, Utah.

18. Keith, John E. et al. 1973. "Interregional Planning of Water Resources Allocations by Systems Analysis Approach: A Summary Report." PRWG-100-5 Utah Water Research Laboratory, Logan, Utah. July.

19. Kneese, Allen. 1975. Mitigating the Undesirable Aspects of Boomtown Development in Energy Development in the Rocky Mountain Region: Goals and Concerns. James A. Pulver and Bruce J. Polich, (eds.) Federation of Rocky Mountain States, Inc. (Denver)

20. Lancaster County Planning Commission. 1966. Open Space in Lancaster County. April.

21. Leone, Mark. 1972. "The Evolution of Mormon Culture in Eastern Arizona," Utah Historical Quarterly. (Spring)

22. Lewis, W. Cris. 1969. An Econometric Model of Urban-Rural Structure and Development. Unpublished PhD. dissertation. Iowa State University.

23. Lewis, W. Cris. 1972. Public Investment Impacts and Regional Economic Growth. Water Resources Research. August.

24. McKeever, J. Ross. 1968. The Community Builder's Handbook. Urban Land Institute. (Washington, D.C.)

25. Mields, Hugh. 1973. Federally Assisted New Communities: New Dimensions in Urban Development. Urban Land Institute (Washington, D.C.)

26. Moody, Harold T. and Frank W. Puffer. 1970. The Empirical Verification of the Urban Base Multiplier: Traditional and Adjustment Process Models. Land Economics. Vol. 46: 91-98. February.

27. Nellis, Lee. 1974. What Does Energy Development Mean for Wyoming. Human Organization. 33: 229-238.

28. Niedercorn, John H. and Edward F. R. Hearle. ca. 1966. Recent Land-use Trends in Forty-Eight Large American Cities. Rand Corporation. Santa Monica, California.

29. Oil and Gas Journal. 1975. Mid-year Report. July 28.

30. Palmer, Edgar Z. (ed.) 1958. The Community Economic Base and Multiplier. University of Nebraska.

31. Real Estate Research Corporation. 1974. The Costs of Sprawl. Report Prepared for Council on Environmental Quality, U.S. Department of Health, Education, and Welfare, and U.S. Environmental Protection Agency. April.

32. Roberts, Roland. 1975. The Analysis and Implications of Oil Shale Development on the Demand for Housing in Uintah County. Unpublished MS thesis, Department of Economics, Utah State University. Logan, Utah.

33. THK Associates, Inc. 1974. Impact Analysis and Development Patterns for the Oil Shale Region: Mesa, Garfield, and Rio Blanco counties, Colorado. Denver.

34. Thompson, Gerald E. 1959. An Investigation of the Local Employment Multiplier. Review of Economics and Statistics. Vol. 41: 61-67.

35. Urban Land Institute. 1968. The Community Builder's Handbook. Washington, D.C.

36. U.S. Bureau of the Census. 1974. Statistical Abstract of the United States 1972. (Washington, D.C.) U.S. Government Printing Office.

37. U.S. Bureau of Mines, 1974. Minerals Yearbook, 1972. (Washington, D.C.) U.S. Government Printing Office.

38. U.S. Department of Commerce. 1975. Survey of Current Business. Vol. 55. No. 7. Bureau of Economic Analysis. July.

39. U.S. Department of Housing and Urban Development. 1972. "Utah City and County Government Financial Compendium" Community Assistance Division Department of Community Affairs, Utah, June 30.

40. U.S. Department of Labor. 1974. Monthly Labor Review. December.

41. Von Hertzen, Heikki and Paul D. Spreiregen. 1973. Building a New Town: Finland's Garden City. MIT Press (Cambridge, Mass.)

42. Water Resources Council. 1971. "Upper Colorado Region: Comprehensive Framewater Study." Appendix VI, Economic Base and Projections, Upper Colorado Region State-Federal Interagency Group. June.

43. Weiss, Shirley F. et al. 1971a. New Community Development: Planning Process Implementation and Emerging Social Concerns. Volume 1. Center For Urban and Regional Studies. University of North Carolina at Chapel Hill. February.

44. Weiss, Shirley F. et al. 1971b. New Community Development: Planning Process Implementation and Emerging Social Concerns. Volume 2. Center for Urban and Regional Studies. University of North Carolina at Chapel Hill. October.

45. Weiss, Shirley F. 1973. New Town Development in the United States: Experiment in Private Enterprise. Center for Urban and Regional Studies. University of North Carolina at Chapel Hill. March.

46. White, Gilbert and Gottfried Lang. 1975. Community Mobilization for Adaptation to Change in Rapid Growth Areas, in Energy Development in the Rocky Mountain Region: Goals and Concerns. James A. Pulver and Bruce J. Polich (eds.) Federation of Rocky Mountain States, Inc. (Denver).

APPENDIX A - Multiplier Estimation

A.1 The Employment Multiplier

A.1.1 Export Base Theory

The export-base theory of regional growth provides the conceptual basis for the estimation of the total employment impact associated with the proposed action. This concept has been widely used to estimate and predict the impacts of exogenous changes on urban and regional economies, and is based on the dichotomy between export (basic) and local service (non-basic) employment.[a] Essentially, export employment (i.e., employment in those sectors producing goods and services sold to individuals and firms whose source of payment originates outside the region under study) is considered to be the "energizing" component of regional growth. These export sales generate flows of income (the regional analog of foreign exchange) that can be used to purchase those goods and services produced and sold locally as well as to finance "imports" from other regions. As the size of the export sector increases or decreases, the volume of income earned and available for spending on locally produced output will change proportionally. Because of this, there is generally considered to be a stable functional relationship between basic (or export) and non-basic (non-export) employment. An exogenous change in the former, such as the employment increase associated with an oil shale complex in the Uintah Basin, will result in a

[a] Basic and non-basic employment are essentially synonomous with the terms direct and indirect employment used in Chapter 2.0.

predictable change in the latter, thus allowing the total employment impact to be estimated.

Tiebout (1962:13), generally regarded as one of the earliest to articulate this concept, summarized the theory in the following way:

> The goods and services which the community sells outside its boundaries are considered exports. Exports include all sales made outside the community not just trade with foreign nations. The remaining goods and services go to the local market. Local is defined to mean the geographic region being studied.
>
> Implicit in this division of markets is the cause and effect relationship. Export markets are considered the prime mover of the local economy. If employment serving this market rises or falls, employment serving the local market is presumed to move in the same direction. When the factory (export) closes, retail merchants (local) feel the impact as laid-off factory workers have less to spend. Because of this prime mover role export employment is considered as "basic." Employment which serves the local market is considered adaptive and is titled "non-basic."

Furthermore, even casual observation of the empirical evidence will confirm a close functional relationship between employment and population; it could hardly be otherwise. New employment opportunities mean immigration of workers and their families. These new families demand services from both the private and public sector, with a resultant increase in jobs for retail clerks, school teachers, policemen, etc. Some of these new jobs are filled by local residents, but many are taken by other new migrants who, of course, bring their families, thus reinforcing the growth process. It is generally expected that one new job in the basic sector will, through the multiple effects of the income created flowing through the regional economy, result in an increase of one to two jobs in the non-basic sectors. In addition, each new job may increase population, again, by two or three. More precise estimates

of these relationships are outlined below. Before that, however, it will be useful to summarize formally the export-base theory.

Mathematically, total employment in the region (E_T) is identically equal to the sum of employment in the basic (E_B) and non-basic sectors (E_{NB}):

$$(1) \quad E_T \equiv E_B + E_{NB}$$

Basic employment is assumed to be an exogenous variable; that is, it depends on extra-regional forces that determine export demand. In terms of oil shale activity in the Uintah Basin, basic employment levels will depend on demand for the oil and related products.

Thus, we can write

$$(2) \quad E_B = E_B^\circ$$

where E_B° represents an exogenously determined level of basic employment. As explained above, non-basic employment is considered to be a stable function of basic employment

$$(3) \quad E_{NB} = a_1 + b_1 E_B^\circ$$

where b_1 is the non-basic/basic employment multiplier and a_1 is simply the constant term in this linear equation.[a] Alternatively, we could solve for total employment as a function of basic employment

$$(4) \quad E_T = E_B + E_{NB}$$

$$= E_B^\circ + a_1 + b_1 E_B^\circ$$

$$= a_1 + (1 + b_1) E_B^\circ$$

---

[a] Although this linear function relating E_{NB} and E_B is fairly standard, various other functional forms have been used in export-base models.

where $(1 + b_1)$ is a total/basic employment multiplier. The system is closed by adding an equation where population (P) is a linear function of total employment

$$(5) \quad P + a_2 + b_2 E_T$$

where b_2 is the marginal population/employment multiplier and a_2 is a constant.

This recursive sequence takes exogenous levels of export employment and determines non-basic or service employment in Equation (3). Total employment is exhaustively distributed between its export and service components (Equation (1)) and determined by export employment in Equation (4), population levels are expressed as a function of total employment demand in Equation (5).

A.1.2 Multiplier Estimation

The estimation of the non-basic/basic multiplier (i.e., the estimation of the parameter b_1 in Equation (3)) can be done in one of several ways:

A) Measure basic and non-basic employment in a number of regions and use a least squares regression technique to estimate b_1;[a]

B) Use a simpler ratio technique by finding E_{NB}/E_B for the region under study or an average ratio for several regions;

---

[a]The changes in basic and non-basic employment over some time interval might be used as an alternative.

C) Measure a vector of minimum requirements proportions, P_i^*, and estimate the E_{NB}/E_B ratio or

$$E_{NB}/E_B = (1 - \Sigma P_i^*)^{-1} - 1$$

D) Select one or more comparable regions which have been impacted by some major government or private sector action and trace the change in non-basic employment that followed expansion in the basic sector.

To provide some idea of the approximate magnitudes of the basic/non-basic employment multiplier, estimates from several empirical studies are listed in Table A.1.2-1. The regression estimates (that technique was used in four studies) ranged from 1.14 to 1.33. That is, every additional job in an export sector could be expected to result in the creation of slightly more than one more job in the non-basic sectors. The Chamber of Commerce Study (1973) was based on case studies of industrial growth in ten rural counties, mainly in the southeastern states. The estimated multiplier of 0.68, while lower than the others, is not necessarily inconsistent because it has been empirically verified that the employment multiplier will increase with the economic size of the region. The areas studied by the Chamber of Commerce tended to be smaller in population than were those used in the other studies.

Studies done specifically for the oil shale industry (Gilmore and Duff (1973), THK Associates (1974), and Colony Development Operation (1974)) have derived multipliers ranging from 0.8 to 2.2. Ratio estimation of the employment multiplier in the Uintah Basin counties are reported in Table A.1.2-2; these estimates range from 1.32 to 1.54.

TABLE A.1.2-1 SELECTED NON-BASIC/BASIC EMPLOYMENT MULTIPLIER ESTIMATES

Study	Non-basic/basic Employment multiplier
Booz, Allen & Hamilton, Inc. (1974)	0.45-2.00[a]
Call Engineering, Inc. (1975)	1.50
Chamber of Commerce (1973)	0.68
Colony Development Operation (1974)	0.5-1.0[b]; 1.5[c]
Gilmore and Duff (1973)	0.8-2.2
Hildebrand and Mace (1950)	1.25
Lewis (1969)	1.33
Moody and Puffer (1970)	1.14
Palmer (1958)	0.97-1.79
THK Associates (1974)	2.00
Thompson (1959)	1.31

[a]Varies with economic size of the region.

[b]Construction phase.

[c]Operations phase.

TABLE A.1.2-2 RATIO ESTIMATES OF THE NON-BASIC/ BASIC EMPLOYMENT MULTIPLIER: DUCHESNE, UINTAH, AND RIO BLANCO COUNTIES, 1970

	County		
	Duchesne	Uintah	Rio Blanco
Total Employment:	2,413	4,163	1,980
Basic Employment	949	1,794	781
Non-basic Employment	1,464	2,369	1,199
Non-basic/Basic Employment	1.54/1.0	1.32/1.0	1.54/1.0

A.1.3 Multiplier Estimation

The employment multiplier used in Chapter 2.0 to project the non-basic or service employment associated with direct employment in the oil shale complex in the Uintah Basin was estimated in the following way:

A) Detailed employment data were collected for all counties in the intermountain region (i.e., Idaho, Montana, Wyoming, Utah, Arizona, and New Mexico).

B) Export base and service industries were identified on the following basis:

Export Sectors (basic)	Local Service Sectors (non-basic)
Agriculture	Construction
Mining	Communications
Manufacturing	Electric, gas, and sanitary services
Transportation	Wholesale trade
Federal Government	Retail trade
	Finance, insurance, and real estate
	Services
	Local government

C) A variant of Equation (3) was estimated by ordinary least squares regression techniques using the county data just described. Specifically, non-basic employment (E_{NB}) was regressed on basic employment (E_B), a gravity variable relating distance of the county to a major metropolitan center and size of that center, and a dummy variable indexing the

size of the local economy. The gravity variable is included to capture the effect of proximity to larger cities. In general, the employment multiplier will tend to be smaller as distance to a major center declines because local residents often will travel to that center for a variety of goods and services which results in an income "leakage" from the county. The net effect of this phenomenon is that the non-basic employment required to service the local population will be smaller than it would had that income been spent locally.

To better identify and estimate the incremental change in non-basic employment caused by a change in the size of the export sector, changes in the employment variables during the period 1960-1970 were used. The estimated equation coefficients are as follows:

Dependent Variable = Change in non-basic employment, 1960-70

Independent Variables	Estimated Coefficient[a]
Change in basic employment, 1960-70	1.3** (non-basic/basic multiplier)
Index of local economy size	763.5*
Gravity	0.01**

Coefficient of determination (R^2) = 0.94.

These statistical results are quite satisfactory as the estimated non-basic/basic multiplier (1.3) is statistically different from zero at the 0.01 probability level, and the equational statistic, R^2, is in

[a]The single and double asterisks (i.e., * and **) indicate that the coefficients are significant at the 0.05 and 0.01 probability levels, respectively.

excess of 0.90, implying that more than 90 percent of the intercounty variation in non-basic employment is explained by changes in basic employment.

Because the multiplier will increase as the size of the regional economy increases, the multiplier is increased to a level of 1.5 during the final phase of the commercial stage of production. In addition, the lag in the response of non-basic or indirect employment to changes in direct employment is recognized. The employment multiplier begins at a level of 0.3, increases to 1.0 after ten years, and then increases to 1.5 in the final production stage. The time path of this multiplier is shown in Table A.2-1 in a following section.

A.1.4 Effect of Unemployment on the Multiplier

It is well known that an area with extensive unemployment will tend to have a smaller employment multiplier than will an area characterized by full or over-full employment. In the former case, new jobs may largely accrue to currently unemployed residents, meaning little or no change in population and, therefore, little change in demand for population-induced economic activity. Because the Uintah Basin is characterized by a relatively full employment situation, no such adjustment is necessary. This approach is consistent with that outlined in the procedures manual for preparing socioeconomic impact statements developed by Booz, Allen & Hamilton (1974).

A.2 Population and Household Multipliers

The key household per worker and population per worker multipliers were adapted from those developed for the large Kaiparowits Power Plant project[a] to be developed in Southern Utah. Because there appears to be a significant parallel between the two projects in terms of locational characteristics, employee number and timing, and community requirements, it is appropriate to use comparable multipliers. The basic assumptions required include:

A) Overall distribution of wage levels for the permanent work force will be similar.

B) Basic demographic composition of the work force (i.e., distribution of workers, family size, etc) will be similar.

C) Life style preferences in terms of housing, community assenities, and recreational desires will be similar.

The values of the various multipliers by year are listed in Table A.2-1. These are the basic components used to project indirect employment, population, and households in Chapter 2.0.

---

[a]See Call Engineering, 1975.

TABLE A.2-1 POPULATION, HOUSEHOLD, AND EMPLOYMENT MULTIPLIERS

Year	Population per household	Households per worker	Population per worker	Indirect employment multiplier
Pre-Commercial Stage				
1	3.0	0.90	2.70	0.3
2	3.0	0.90	2.70	0.3
3	3.3	0.88	2.90	0.4
4	3.3	0.88	2.90	0.5
Commercial Stage--Phase I				
5	3.3	0.80	2.64	0.5
6	3.3	0.80	2.64	0.5
7	3.3	0.78	2.57	0.6
8	3.3	0.76	2.51	0.7
9	3.3	0.74	2.44	0.9
10	3.2	0.72	2.37	1.0
Commercial Stage--Phase II				
15	3.2	0.68	2.18	1.5
20	3.2	0.68	2.18	1.5

A.3 Determination of the Population "Capture Rate" for the New Town

A thorough review of the relevant literature[a] and discussions with city planning experts revealed a total lack of any substantive methodology for determining the population "capture rates"[b] for the new town. Three alternative methods were developed for this study as reviewed in detail in the following. Based on these results a capture rate of 80 percent is used. The reader should be cautioned that this is an approximation as there is no way to definitively predict or project the acutal rate.

The first method is simply an ad hoc approach which assumes that ultimately all operating employees and their families and one-half of the population impact associated with indirect employment would reside in the new town.[c] Using this method, allocation of population to the new town is made in the following way:

---

[a] See, for example, Barasch (1974), Clapp (1971), Derthick (1972), Mields (1973), Von Hertzen and Spreiregen (1973), and Weiss (1971a, 1971b, and 1973).

[b] The percentage of the total population impact that would locate in the proposed new town.

[c] In the early years of the project (i.e., years (1) to (4)), it is likely that a significant part of the labor force at the site will be drawn from residents of Uintah Basin communities, especially Vernal and Rangely. As the size of the required labor force increases, the new jobs will increasingly be filled with workers from other areas. As new town development probably will tend to parallel later (Phase I and II) project development, these new in-migrants probably will find that housing availability and close proximity to the complex make the new town the preferred residential choice.

Source	Population Impact[a]	Assumed Capture Rate	New Town Population
Operations-based	5,014	100%	5,014
Indirect-based	7,521	50%	3,761
Total	12,535		8,775

The derived capture rate under this model is 70 percent.

The basic gravity model used in section 2.6 to allocate population among existing communities can also be used to determine a "capture" rate. That model was

$$G_i = \frac{P_i}{D_i^2}$$

where G_i is the computed gravity index, P_i is the population of the city in question, and D_i is the distance from that city to the project site. The proportion of population assigned to each city (i.e., the capture rate) is $G_i/\Sigma G_i$. Three primary potential residential sites are defined--Vernal (about 50 miles by existing roads to the site), Rangely (30 miles), and the new town (3 miles).[b]

The index for the new town is a function of its population which is unknown. The gravity index and gravity proportion (i.e., capture rate) can be determined for alternative levels of population as outlined below:

---

[a] From Table 2.3-1.

[b] Because a specific site for the new town has not been selected, the distance of three miles to the proposed complex is an approximation.

Hypothetical New Town Population	Gravity Index	Gravity Proportion (Capture Rate)
500	20.0	0.79
1,000	40.0	0.88
2,000	80.0	0.94
5,000	200.0	0.97
10,000	400.0	0.99

Because of the very close proximity of the new town site to the complex, the capture rate is quite high, exceeding 90 percent for an hypothetical new town population in excess of 1,000 residents. Because of the large disparities in distance, the gravity model estimates are probably biased upward.

A better alternative is to develop housing or location demand functions for each of the three cities under study and use them to determine the new town capture rate. A general log-linear demand function is specified for each city

$$D^*_{Hi} = a[1/(P_i/\overline{P})]^{\alpha} (Q_i/\overline{Q})^{\beta} [1/(D_i/\overline{D})]^{\gamma}, \quad i = V, R, N^a$$

Where D^*_{Hi} represents demand for housing[b] in the ith location, P_i = the price of housing, Q_i = the quality of housing, and D_i = the distance from the city to the production site. $\overline{P}$, $\overline{Q}$, and $\overline{D}$ represent the average of the price, quality, and distance variables for the three cities. Because demand for housing is inversely related to relative price ($P_i/\overline{P}$) and

[a]The subscripts V, R, and N represent Vernal, Rangely, and the new town. That is, D^*_{HN} would represent demand for housing in the new town.

[b]Housing demand will be measured in population units for the purpose of this analysis.

distance ($D_i/\bar{D}$), the reciprocals of those terms are used in the equations. Equivalently, the equation could be written

$$D^*_{Hi} = a(\bar{P}/P_i)^{\alpha} (Q_i\bar{Q})^{\beta} (\bar{D}/D_i)^{\gamma}, \quad i = V, R, N$$

Assuming that housing prices and quality will be approximately the same in all locations (i.e., $P_i = P_j$ and $Q_i = Q_i$ for all i and j),[a] the ratio of any two of these demand curves, say Vernal and the new town, becomes a function of relative distances only because all other terms drop out.

$$\frac{D^*_{HV}}{D^*_{HN}} = \frac{a(\bar{P}/P_V)^{\alpha}}{a(\bar{P}/P_N)^{\alpha}} \frac{(Q_V/\bar{Q})^{\beta}}{(Q_N/\bar{Q})^{\beta}} \frac{(\bar{D}/D_V)}{(\bar{D}/D_N)} = \frac{D_N}{D_V}$$

Because the distances are known, the relative demands are determinate, and because the total population impact is known, the allocation to each area (i.e., the capture rate) can also be determined.

The three demand ratios are

Vernal-New Town	Vernal-Rangely	Rangely-New Town
$\frac{D^*_{HV}}{D^*_{HN}} = \frac{3}{50} = 0.06;$	$\frac{D^*_{HV}}{D^*_{HR}} = \frac{30}{50} = 0.60;$	$\frac{D^*_{HR}}{D^*_{HN}} = \frac{3}{30} = 0.10$

This yields three equations in three unknowns

1) $D^*_{HV} = 0.06\ D^*_{HN}$

2) $D^*_{HV} = 0.60\ D^*_{HR}$

3) $D^*_{HR} = 0.10\ D^*_{HN}$

---

[a] The implications of differential prices and quality are discussed below.

Now the share of population allocated to the new town is total population (T = 12,535) minus that allocated to the other cities,

$$D^*_{HN} = T - D^*_{HV} - D^*_{HR}$$

Making appropriate substitutions for D^*_{HV} and D^*_{HR} yields

$$D^*_{HN} = 12,535 - 0.06D^*_{HN} - 0.10\ D^*_{HN}$$

which when solved yields

$$D^*_{HN} = 10,805$$

or 86 percent of the total population impact accruing to the new town.

The capture rate will vary inversely with relative housing prices in the new town and directly with relative quality. That is, if new town housing prices are higher than in other Uintah Basin, the capture rate will be lower; if housing quality in the new town is better at comparable prices, the capture rate will be higher. Because the parameters of the demand functions cannot be estimated, it is impossible to quantify these effects.

Under proposals for new roads, the distances from Vernal to the plant site would be reduced to 37 miles and Roosevelt would have to be considered because the distance from there to the plant site would be approximately 65 miles.

The demand ratios would be

$$\frac{D^*_{HV}}{D^*_{HN}} = \frac{3}{37} = 0.08; \qquad \frac{D^*_{HR}}{D^*_{HN}} = \frac{3}{30} = 0.10; \qquad \frac{D^*_{HR'}}{D^*_{HN}}{}^{a} = \frac{3}{65} = 0.05$$

and the summary equation would then be

$$D^*_{HN} = 12,535 - 0.08\ D^*_{HN} - 0.10\ D^*_{HN} - 0.05\ D^*_{HN}$$

---

[a] The subscript R' indicates Roosevelt.

which yields

$$D^{*}_{HN} - 10,191$$

or a "capture rate" of 81 percent.

A slightly more conservative capture rate of 80 percent is used in Chapter 2.0 to make the acutal allocation of population. This rate allows for the possibility that early oil shale operations may precede new town development, and that a significant part of the employment will accrue to residents of Vernal, Rangely, and possibly other places in the Uintah Basin some of whom will not change their place of residence when the proposed new town is built.

APPENDIX B - Basic Land Use Data

B. BASIC LAND USE DATA

In order to develop the land-use absorption coefficients used in Section 3.1, it was necessary to review a number of fairly large-scale development projects and related studies. A brief summary of this review is presented in this appendix.

The average land use structure in 53 large cities in the United States is shown in Table B-1. On average, 6.14 acres are required for all urban purposes (i.e., housing, commercial, industries, transportation, and public activities) per 100 population. Although this data is informative, it does not reflect land development at the margin, i.e., new developments probably differ significantly in the proportions of land devoted to particular uses and in the intensity of use.

To provide an approximation of land use demands in relatively new areas, detailed data are provided on five major real estate developments across the United States. These projects resulted in the construction of communities with populations ranging from 2,100 to more than 21,000. Land-use data for each are provided in Tables B-2 through B-6. Summary data for all the projects are shown in Table B-7.

Although there is significant variation among the projects, they average 7.8 residential acres per 100 population and 10.2 gross acres per 100 population. Densities average 3.3 dwelling units and 10.5 persons per gross acre. The variation in population densities is explained by difference in the composition of housing (i.e., single family versus multi-family) and by the relative amounts of land devoted to such non-residential uses as commercial, recreation, and open space.

TABLE B-1 AREAS OF LAND USED PER 100 PERSONS--AVERAGES IN 53 AMERICAN CITIES, 1965

Land Use	Acres per 100 persons
Residential:	
Single family dwellings	2.19
Two family dwellings	0.33
Multi-family dwellings	0.21
Commercial:	0.28
Industrial:	
Light industry	0.20
Heavy industry	0.25
Railroad Property:	0.33
Public and Semi-public Property:	
Streets	1.19
Parks and playgrounds	0.41
Other public	0.75
TOTAL	6.14

SOURCE: Bartholomew, 1965.

TABLE B-2

LAND USE, PER 100 PERSONS, AND TOTAL, PLANNED UNIT DEVELOPMENT IN STRONGSVILLE, OHIO

	Units	Acres	Land use per 100 persons
Residential:			
Single family dwelling	490	152	8.4 acres
2-4 family dwellings	492	33	2.8 acres
Commercial:		21	0.7
Industrial:			
Light		--	--
Heavy		--	--
Public:			
Streets		a	a
Parks and recreation		75	2.5
Schools			
Other		--	
TOTAL		281	9.4
Densities:			
Dwelling units per gross acre		3.5	
Population per gross acre		10.7	
Dwelling units per residential acre		5.3	
Population per residential acre		16.2	

[a]Included in other categories.

SOURCE: Urban Land Institute, 1968.

TABLE B-3 LAND USE, TOTAL AND PER 100 PERSONS, KIMBERLY, COLUMBUS, OHIO

Type of development: Residential Planned Unit Development	Housing units	Acres	Land use per 100 persons
Residential:			
Single family dwelling	635	137	5.8
Townhouses	363	53	4.0
2-4 family dwellings	161	23	6.0
Apartments	400	10	1.0
Commercial:		41	0.8
Industrial:			
Light		--	--
Heavy		--	--
Public:			
Streets		a	--
Parks and recreation		64	1.3
Schools		10	0.2
Other		--	--
TOTAL		338	6.7

Densities:	
Dwelling units per gross acre	4.6
Population per gross acre	14.9
Dwelling units per residential acre	7.0
Population per residential acre	22.6

[a]Land area for streets included in residential land.

SOURCE: Urban Land Institute, 1968.

TABLE B-4 LAND USE, TOTAL AND PER 100 PERSONS: HAMDEN HEIGHTS, COLORADO

Type or development	Units	Acres	Land use per 100 persons
Residential:			
Single family dwelling 2-4 family dwellings Apartments	605	254	12.1 acres
Commercial:		60	2.9
Industrial:			
Light		--	
Heavy		--	
Public:			
Streets		--	
Parks and recreation		a	
Schools		a	
Other		--	
TOTAL		304	14.5

Densities:	
Dwelling units per gross acre	2.3
Population per gross acre	6.9
Dwelling units per residential acre	2.4
Population per residential acre	8.3

[a]Included in residential land use.

SOURCE: Urban Land Institute, 1968.

TABLE B-5 LAND USE, TOTAL AND PER 100 PERSONS, "DEVIL'S THUMB" PLANNED UNIT DEVELOPMENT IN BOULDER, COLORADO

	Units	Acres	Land use per 100 persons
Residential:			
Single family dwelling	332	108.8	7.4 acres
2-4 family dwellings	100		
Commercial:		--	--
Industrial:			
Light		--	--
Heavy		--	--
Public:			
Streets		a	--
Parks and recreation		15.6	1.1
Schools		--	--
Other		--	--
TOTAL		124.4	8.5
Densities:			
Dwelling units per gross acre		3.5	
Population per gross acre		11.8	
Dwelling units per residential acre		4.0	
Population per residential acre		13.5	

[a]Included in other categories.

SOURCE: Urban Land Institute, 1968.

TABLE B-6 LAND USE, TOTAL AND PER 100 PERSONS, NORTHGLENN, COLORADO

Type of development: Self-contained community	Units	Acres	Land use per 100 persons
Residential:			
Single family dwelling			
2-4 family dwellings	7,000	1,870	8.8
Apartments			
Commercial:		118	0.6
Industrial:			
Light		145	0.7
Public and Semi-public:			
Streets		a	--
Parks and recreation		349	1.6
Schools			
Other		47	0.2
TOTAL		2,529	11.8
Densities:			
Dwelling units per gross acre		2.8	
Population per gross acre		8.4	
Dwelling units per residential acre		3.7	
Population per residential acre		11.4	

[a]Included in other land use categories.

SOURCE: Urban Land Institute, 1968.

TABLE B-7 RANGE OF LAND-USE ABSORPTION COEFFICIENTS AND DENSITIES

	Range	Unweighted average	Weighted average[a]
Land use per 100 persons:			
Residential	4.4-12.1 acres	7.8	8.0
Total	6.7-14.5 acres	10.2	10.8
Range of Densities:			
Dwelling units per gross acre	2.3- 4.6	3.3	3.1
Population per gross acre	6.9-14.9	10.5	9.7
Dwelling units per residential acre	2.4- 7.0	4.5	4.3
Population per residential acre	8.3-22.6	14.4	13.5

[a]Weighted by population.

SOURCE: Derived from data in Tables B-2 through B-6.

The data on Northglenn, Colorado, is especially relevant because that project developed a complete city with full commercial facilities, industry, and schools and recreation areas, and because its size (more than 21,000 persons) makes it roughly comparable to the size of one new town at or near the oil shale tracts.

Three other studies of land-use impacts are also relevant to the land-use analysis. The Urban Land Institute has developed a set of land-use projections for a satellite community of 30,000; these data are presented in Table B-8. These projections imply land-use absorption per 100 population of 6.67 acres for residential uses and about 12 acres per 100 persons, overall.

Data from a study for the County Planning Commission, Lancaster County, Pennsylvania, is reported in Table B-9. This study projects land-use absorption rates of 9.0 acres per 100 persons and an overall rate of 12.8.

Finally, a study made specifically for projecting the impacts of oil shale development in Western Colorado (THK Associates, 1974) outlined the land area needs for a variety of residential land uses. As shown in Table B-10, the land needed for 100 additional persons ranges from 145 acres where homes are built on 5-acre sites to 3.8 acres for high-density multi-family units.[a]

---

[a]These coefficients include land necessary for streets and community facilities but not for commercial and industrial uses.

TABLE B-8 LAND USE PROJECTION FOR A SATELLITE COMMUNITY

Industrial Land Use:

Large plants (100 or more employees)	10-20 employees per gross acre
Small plants (10-50 employees)	5 employees per gross acre
Commercial Land Use (retail shopping):	2-3 acres per 1,000 population
Residential Land Use:	
Single family	100 acres gross to house 1,000 population
Multi-family	15-30 acres gross per 1,000 population
Recreational and Park Land:	15 acres per 1,000 population

Possible Pattern for a Planned Satellite Community: (30,000 people)

	Gross area (acres)	Land-use per 100 persons (acres)
5,000 single-family detached houses	1,300	
1,500 townhouses	400	6.67
3,500 apartment units (garden and highrise)	300	
Park and recreational land	400	1.33
School sites	100	0.33
Shopping centers	300	1.00
Other commercial	200	0.67
Industrial (employment for 4,500 persons)	400	1.33
Total area used	3,600	11.33

SOURCE: Urban Land Institute (1969:133).

TABLE B-9

LAND-USE PROJECTION AND ABSORPTION COEFFICIENTS: LANCASTER COUNTY, PENNSYLVANIA

Impact of 1,000 new residents:

270 families
500 adults
300 school children
200 preschool children

	Gross area (acres)	Land-use per 100 persons
Residential	90	9.0
Streets	13	1.3
Public	20	2.0
Service industry	3	0.3
Retail	2	0.2
TOTAL	128	12.8

SOURCE: Lancaster County Planning Commission, 1966.

TABLE B-10

LAND AREA NEEDS BY RESIDENTIAL DENSITY PER 100 INCREMENTAL POPULATION PROJECTED FOR WESTERN COLORADO OIL SHALE AREA LAND DEMANDS

Land use	Persons/ dwelling unit	Dwelling unit/ acre	Net residential	Streets	Community facilities	Total[a]
Single family (acreage)						
(5 acre sites)	3.7	0.2	135.0	8.5	1.2	144.7
Single family (rural)						
(2 acre sites)	3.7	0.5	54.0	5.0	1.2	60.2
(1 acre sites)	3.7	1.0	37.0	4.3	1.2	42.5
Single family (urban)						
(12,000 sq.ft. sites)	3.7	3.6	7.5	2.0	1.2	10.7
(9,000 sq.ft. sites)	3.7	4.8	5.6	2.0	1.2	8.8
(7,500 sq.ft. sites)	3.7	5.8	4.7	1.8	1.2	7.7
(6,000 sq.ft. sites)	3.7	7.3	3.7	1.6	1.2	6.5
Mobile homes	2.7	8.0	4.6	1.4	1.4	7.4
Multi-family	2.4	14.0	3.0	0.7	1.4	5.1
Multi-family	2.0	25.0	2.0	0.4	1.4	3.8

[a]Excludes land for commercial and industrial needs.

SOURCE: THK Associates, Inc., 1974.

APPENDIX C - Report by Opinion Sampling Research Institute

SURVEY 75

Public Opinion Survey

of

Uintah Basin Oil Shale Region

by

Lars Peter Hansen

Roger D. Hansen

Randy T. Simmons

of

Opinion Sampling Research Institute

Logan, Utah

December 1975

TABLE OF CONTENTS

1. INTRODUCTION

The Opinion Sampling Research Institute was commissioned by Western Environmental Associates, Inc., to conduct a public opinion survey concerning the possible impact of oil shale development on the residents of the Uintah Basin. The information gathered in this report represents the cumulative imput of 300 residents of Uintah, Duchesne, and Rio Blanco counties. The report synthesizes their perceptions of life in the Basin. All interviews were conducted by telephone between July 16 and July 23, 1975.

The Opinion Sampling Research Institute wishes to thank those 300 people who participated in the study.

2. SUMMARY AND CONCLUSIONS

The survey explored two goals common to the communities of the Uintah Basin. The first concerned preservation of the rural character of the community and the second concerned economic growth. People felt both these goals are desirable but when asked to select between the two, the majority chose economic growth. However, respondents did not necessarily think the two goals were mutually exclusive. Indeed most people felt that the rural character could be preserved while allowing for the expanding economic activities (specifically oil shale development).

The greatest polarizations occurred between the new and established residents and between active Mormons and people with other religious affiliations. Active Mormons were somewhat more concerned about preserving the rural character of their community than were other religious groups. Established residents expressed less support for economic development and more support for the preservation of their rural life style than did new residents. It is important to note, however, that oil shale development was strongly endorsed by all demographic subgroups.

3. METHODOLOGY

The objectives of this survey were four-fold:

1. To ascertain resident opinions concerning possible future oil shale development.

2. To determine resident opinions concerning the relationship between their rural life style and economic development.

3. To ascertain the interaction between the Basin's various religious communities.

4. To determine resident opinions of their communities.

In order to examine these four objectives, 300 heads of households or spouses who live in the area around and including Vernal and Roosevelt, Utah and Rangely, Colorado were interviewed. A four-page questionnaire was developed and pretested in the Uintah Basin. A copy of the questionnaire can be found in Appendix I.

The sample was disproportionately stratified so percentage figures for each city would have a sampling error of not more than ten percentage points at the 95 percent confidence level. The subsamples for each community were proportionately stratified by sex.[1] Results from the various communities were weighted in order that total percentages for the entire population could be estimated. These total percentages had a maximum sampling error of seven percentage points at the 95 percent confidence level. The sample sizes and weighting factors used for each of the cities are given in Table 3-1.

TABLE 3-1

WEIGHTING FACTOR FIGURES

Community	Households[2]	Sample Size	Weighting Factor[3]
Vernal	3300	100	1.71
Roosevelt	1880	100	.97
Rangely	620	100	.32
Total	5800	300	

Estimates in tables are accompanied by their sampling error at the 95 percent confidence level.[4] These sampling errors were determined by computing two standard errors of the estimates. Hypotheses tests were employed to determine if differences between and among estimates of means and percentages were significant. Differences were considered significant if there was less than a 5 percent chance that the differences could be completely accounted for by sampling error.[5] Results from the hypotheses tests can be found in the notes accompanying the test. The following analysis focuses attention on population totals and on significant subgroup differences. A full accounting of the data can be found in Appendix II.

4. THE DEMOGRAPHY OF THE SURVEY

For analytical purposes the sample population was divided into several demographic subgroups. The age subgroups are self-explanatory. Descriptions of the other subgroups follow.

Area:

Rangely: Includes Rangely and the surrounding area
Roosevelt: Includes Roosevelt, Ballard, and Myton
Vernal: Includes Vernal, Naples, Jensen, Bonanza, and Maeser.

Time in Community:

New Resident: Persons who had lived in the community for five years or less.
Established Resident: Persons who had lived in the community for more than five years.

Religion:

Active Mormon: L.D.S. respondents who sometimes or always attend church.
Other: Inactive L.D.S., members of other religious denominations, and those without a religious affiliation.

Income: 1974 pre-tax family income

Oil/Non-oil

Oil Worker: Occupation of the head of the household directly connected with oil production.
Non-oil Worker: Occupation of the head of the household not directly connected with oil production.

The demographic characteristics of the sample can be seen in Table 4-1.

TABLE 4-1

SAMPLE SUBGROUP SIZES

	Total	Rangely	Roosevelt	Vernal
TOTAL	300	100	100	100
SEX:				
Male	150	49	51	50
Female	150	51	49	50
AGE:				
Under 30	101	42	30	29
31-44	100	31	35	34
Over 45	96	25	35	36
Refuse to Answer	3	2	0	1
TIME IN COMMUNITY:				
New Resident	102	32	41	29
Established Resident	198	68	59	71
INCOME:				
Under $8,000	56	21	16	19
$8,000-$15,000	152	53	44	55
Over $15,000	64	16	30	18
Refuse to Answer	28	10	10	8
RELIGION:				
Mormon	148	20	65	63
Non-Mormon	147	77	34	36
Refuse to Answer	5	3	1	1
OIL/NON-OIL:				
Oil Worker	85	38	16	31
Non-oil Worker	210	62	79	69
Refuse to Answer	5	0	5	0

5. SURVEY RESULTS

5.1 OPINIONS CONCERNING PROPOSED ECONOMIC DEVELOPMENT

The expanding population and economic activities in the Uintah Basin received the approval of eight out of ten people (see Table 5.1-1). Nearly all of the new residents favored the expansion activities while less than three-fourths of the established residents felt likewise.

TABLE 5.1-1

DO YOU APPROVE OR DISAPPROVE OF THE AREA'S EXPANDING POPULATION AND ECONOMIC ACTIVITIES?

	Approve	Disapprove	Undecided
	%	%	%
TOTAL	79 ± 5	10 ± 4	11 ± 4
Time in Community:[6]			
New Resident	94 ± 5	3 ± 3	3 ± 4
Established Resident	72 ± 7	14 ± 6	14 ± 6

Even if taxes were to rise moderately, it is estimated that a majority of the people would favor a population increase (see Table 5.1-2). Roosevelt residents had a greater tendency to oppose the population increase than those in Vernal and Rangely. Opinions of persons over forty-five years old were almost evenly divided while younger

persons favored the population increase. New residents and persons from higher income households were heavily in favor of the population influxes. Also opposition was expressed more frequently by non-oil workers than by oil workers.

TABLE 5.1-2

DO YOU FAVOR OR OPPOSE AN INCREASE IN POPULATION IN YOUR COMMUNITY IF IT CAUSES LOCAL TAXES TO RISE MODERATELY?

	Favor	Oppose	Undecided
TOTAL	% 55 ± 6	% 33 ± 6	% 12 ± 4
Area:[7]			
Rangely	61 ± 9	24 ± 3	15 ± 7
Roosevelt	50 ± 10	41 ± 10	9 ± 6
Vernal	56 ± 10	31 ± 9	13 ± 7
Age:[8]			
Under 30	54 ± 12	34 ± 11	12 ± 7
30-44	63 ± 11	23 ± 9	14 ± 8
Over 45	46 ± 11	44 ± 11	10 ± 7
Time in Community:[9]			
New Resident	66 ± 11	24 ± 10	10 ± 7
Established Resident	49 ± 8	38 ± 8	13 ± 5
Income:[10]			
Under $8000	43 ± 15	40 ± 15	17 ± 11
$8000-$15000	54 ± 9	37 ± 9	9 ± 5
Over $15000	70 ± 12	20 ± 10	10 ± 8
Oil/Non-oil:[11]			
Oil Worker	59 ± 13	23 ± 11	18 ± 10
Non-oil Worker	52 ± 8	38 ± 7	10 ± 5

It is estimated that three-fourths (76 percent) of the population had heard of the White River Shale Oil Corporation. Furthermore oil shale development in the Uintah Basin was supported by eight persons in ten (see Table 5.1-3). Just 5 percent disapproved. Community differences emerged as none of the people sampled in Roosevelt disapproved in comparison to 9 percent in Rangely and 7 percent in Vernal.

TABLE 5.1-3

DO YOU APPROVE OR DISAPPROVE OF OIL SHALE DEVELOPMENT IN THE UINTAH BASIN?

	Approve	Disapprove	Undecided
	%	%	%
TOTAL	83 ± 5	5 ± 3	12 ± 4
Area:[12]			
Rangely	73 ± 8	9 ± 5	18 ± 7
Roosevelt	89 ± 6	0 ± 0	11 ± 6
Vernal	82 ± 8	7 ± 5	11 ± 6

Respondents were asked why they approved or disapproved of oil shale development in the Uintah Basin. In general responses centered around two concerns: (1) a desire to stimulate the local economy and (2) a perceived need to increase the national energy supply.

The respondents were then asked how oil shale development could best be undertaken so as to have a positive impact on Basin communities Approximately 40 percent of the sampled residents responded to this question. Responses covered a wide variety of areas including "develop with care," "try to maintain rural area," and "get it organized and underway."

5.2 OPINIONS CONCERNING THE RELATIONSHIP BETWEEN RURAL CHARACTER AND ECONOMIC DEVELOPMENT

The Basin's rural character was liked by seven persons out of eight (see Table 5.2-1). Even higher proportions of older people, established residents and active Mormons liked the rural character of their community.

TABLE 5.2-1

DO YOU LIKE OR DISLIKE THE RURAL CHARACTER OF YOUR COMMUNITY?

	Like	Dislike	Undecided
	%	%	%
TOTAL	87 ± 4	6 ± 3	7 ± 3
Age:[13]			
Under 30	75 ± 10	14 ± 8	11 ± 7
30-44	91 ± 6	2 ± 3	7 ± 5
Over 45	92 ± 6	4 ± 4	4 ± 4
Time in Community:[14]			
New Resident	77 ± 9	9 ± 6	14 ± 8
Established Resident	91 ± 5	5 ± 4	4 ± 3
Religion:[15]			
Active Mormon	94 ± 4	2 ± 2	4 ± 3
Other	78 ± 8	12 ± 6	10 ± 6

The opinion that their community could undergo economic growth and still maintain its rural character was expressed by most of the respondents (see Table 5.2-2). Only about one-fourth believed the rural character could not be preserved. Those with higher incomes were the most inclined to feel that development could be accomplished while preserving their town's rural character.

TABLE 5.2-2

DO YOU FEEL THAT YOUR COMMUNITY CAN UNDERGO ECONOMIC GROWTH AND STILL MAINTAIN IT'S RURAL CHARACTER?

	Yes	No	Undecided
	%	%	%
TOTAL	65 ± 6	23 ± 6	12 ± 4
Income:[16]			
Under $8,000	45 ± 14	32 ± 15	23 ± 14
$8,000-$15,000	65 ± 9	25 ± 8	10 ± 6
Over $15,000	79 ± 10	14 ± 9	7 ± 7

When offered the choice between economic growth and preserving the rural character of the community, six in ten chose economic growth (see Table 5.2-3). Just three in ten selected preserving the rural character, and one in ten was undecided. Roosevelt was the only community in which a majority of the respondents did not desire economic development at the expense of the town's rural character. However, a slight plurality did indicate they preferred economic growth. New residents expressed the

strongest inclination toward economic growth. While a slight majority of active Mormons selected economic growth, nearly two-thirds of the people with other religious affiliations desired increased economic activity.

TABLE 5.2-3

IF YOU HAD TO CHOOSE BETWEEN THE FOLLOWING TWO ALTERNATIVES WHICH WOULD YOU PREFER: ECONOMIC GROWTH OR PRESERVING THE RURAL CHARACTER OF THE COMMUNITY?

	Economic Growth	Rural Character	Undecided
	%	%	%
TOTAL	58 ± 6	31 ± 6	11 ± 4
Area:[17]			
Rangely	61 ± 9	27 ± 8	12 ± 6
Roosevelt	47 ±10	41 ± 10	12 ± 6
Vernal	63 ±10	26 ± 9	11 ± 6
Time in Community:[18]			
New Resident	72 ±10	21 ± 9	7 ± 5
Established Resident	50 ± 8	36 ± 7	14 ± 6
Religion:[19]			
Active Mormon	52 ± 9	38 ± 9	10 ± 5
Other	65 ± 9	23 ± 7	12 ± 6

5.3 OPINIONS CONCERNING MORMONS AND NON-MORMONS

When the non-Mormons were asked their impression of the Mormon community in their town, about one-fourth responded positively and one-fourth negatively (see Table 5.3-1). Another 8 percent gave a qualified positive response. The remaining comments were passive. While a third of the people in Vernal and Roosevelt had a negative impression of Mormons, only one person out of ten in Rangely was negatively impressed. Furthermore, nearly half of the Rangely residents were passive towards the Mormons in comparison to one-third of those in Vernal and Roosevelt. A complete list of responses to this open-ended question can be found in Appendix III.

TABLE 5.3-1

WHAT IS YOUR IMPRESSION OF THE MORMON COMMUNITY IN YOUR TOWN?

	Positive	Positive But	Passive	Negative
	%	%	%	%
TOTAL	26 ± 9	9 ± 6	37 ± 9	28 ± 9
Area:[20]				
Rangely	34 ± 10	5 ± 5	50 ± 10	11 ± 6
Vernal & Roosevelt	23 ± 11	10 ± 7	34 ± 12	33 ± 12

Four persons in ten stated that a substantial non-Mormon population increase would exert a positive influence on the educational system (see Table 5.3-2). According to 36 percent of the people there would be no effect on the system and just 7 percent felt the effect would be negative.

A third of the active Mormons and non-oil workers anticipated a positive influence in contrast to half of the oil workers and persons with other religious affiliations. In response to the open-ended part of this question (Would you please explain your answer?) most active Mormons expressed the hope that an increase in population and tax-base would help bring about continued improvement in the schools.

TABLE 5.3-2

DO YOU FEEL LARGE INCREASE IN THE NON-MORMON POPULATION WOULD HAVE A POSITIVE OR NEGATIVE INFLUENCE ON THE EDUCATIONAL SYSTEM?

	Positive	Positive But	Passive	Negative
	%	%	%	%
TOTAL	39 ± 7	7 ± 4	36 ± 7	18 ± 6
Religion:[21]				
Active Mormon	33 ± 9	9 ± 5	40 ± 9	18 ± 8
Other	47 ± 11	5 ± 5	32 ± 10	16 ± 8
Oil/Non-oil:[22]				
Oil Worker	54 ± 15	7 ± 7	29 ± 14	10 ± 9
Non-Oil Worker	34 ± 8	7 ± 4	38 ± 8	21 ± 7

A large influx of non-Mormons would have a positive influence on community character according to three persons in ten (see Table 5.3-3). Another three in ten felt there would be no effect while 16 percent claimed that the influx would have a negative influence. Active Mormons were the least prone to feel the effect on the character of the community

would be positive rather than negative. Most comments by active Mormons to the open-ended part of this question seemed to center around the concern that the incoming people might cause a dilution in community standards. However, just as many Mormons desired that their community have a wider range of view points.

TABLE 5.3-3

DO YOU FEEL LARGE INCREASES IN THE NON-MORMON POPULATION WOULD HAVE A POSITIVE OR NEGATIVE INFLUENCE ON THE CHARACTER OF THE COMMUNITY?

	Positive	Negative	No Effect	Undecided
	%	%	%	%
TOTAL	31 ± 7	16 ± 5	30 ± 7	23 ± 6
Religion:[23]				
Active Mormon	21 ± 8	22 ± 8	32 ± 9	25 ± 8
Other	42 ± 11	9 ± 6	30 ± 10	19 ± 9

5.4 OPINIONS CONCERNING COMMUNITIES

Resident opinions concerning their communities were solicited in three open-ended questions.

The first question asked residents what they most liked about their communities. Approximately 25 percent of the respondents liked the people (e.g. friends, relatives, neighbors) and approximately 35 percent liked the small rural atmosphere of their communities.

The other two questions asked residents what they liked most and least about the recent changes in their communities. Ironically growth scored high on both. Approximately 50 percent felt that growth was a positive change and approximately 25 percent felt it was a negative one.

6. FACTOR ANALYSIS

Factor analysis was used to uncover interrelationships among responses to questions pertaining to people's opinions of their community and the proposed economic activities in their surrounding region. Important independent factors were extracted by employing classical (sometimes referred to as common) factor analysis. Demographic subgroups were then characterized using these factors.

For this analytical procedure, eight variables (corresponding to questions asked to respondents) were used. A description of the variables can be found in Table 6-1.

The number of factors extracted was limited to two and they orthogonally rotated in accord with the varimax procedure. These two factors accounted for 52.4 percent of the total variance. Table 6-2 provides the factor loadings of each of the eight variables.

Six variables dealing explicitly with economic growth loaded high ($|\text{loading}| > .35$) on the first factor. This factor, named economic development, accounted for 79.5 percent of the common variance. Of the five variables pertaining to community size or rural character four loaded high and one moderately high ($|\text{loading}| = .26$) on the second factor. This rural character factor accounted for 20.5 percent of the common variance. Three variables were oriented towards the potential trade offs between economic growth and preservation of the rural character and consequently loaded high or moderately high on both factors with the appropriate sign.

TABLE 6-1

VARIABLE DESCRIPTIONS

Variable	Value		
	-1	0	1
Oil Shale Development	disapprove	undecided	approve
Oil Shale Perspective	disapprove of development	approve of development for reasons other than to stimulate local economy or undecided	approve of development to stimulate local economy
Economic Growth Without Loss to Rural Character	no	undecided	yes
Areas Expanding Population and Economic Activities	disapprove	undecided	approve
Population Increase With Moderate Tax Rise	oppose	undecided	favor
Economic Growth or Preservation of Rural Character	preservation of rural character	undecided	economic growth
Rural Character	dislike	undecided	like
Like Most About Community	nothing	other attributes	smallness

TABLE 6-2

FACTOR LOADINGS*

Variable	Economic Development Factor	Rural Character Factor	h^2
Oil Shale Development	.68	-.02	.47
Oil Shale Perspective	.66	-.00	.44
Economic Growth Without Loss of Rural Character	.50	-.03	.25
Areas Expanding Population and Economic Activities	.60	-.26	.42
Population Increase With Moderate Tax Rise	.51	-.37	.40
Economic Growth or Preservation of Rural Character	.48	-.56	.53
Rural Character	.06	.47	.22
Like Most About Community	-.07	.38	.15
Percent of Common Factor Variance	79.5	20.5	

*Loadings greater than an absolute value of .35 are underlined.

Emergence of economic development and rural character as independent factors is somewhat indicative of the fact the residents of these communities did not perceive the proposed oil shale development activities as a threat to the rural character of their communities.

Using factor score coefficients, two scales were constructed corresponding to the two factors. The scales were designed so that values would range from 0 to 100. Scale values were computed for each respondent, and weighted according to the number of households in each community (i.e. Vernal 1.71, Roosevelt .97, Rangely .32). Values were averaged for each demographic subgroup and comparisons were made. The results are shown in Tables 6-3 and 6-4.

TABLE 6-3

ECONOMIC DEVELOPMENT SCALE

Time in Community:[24]	
New Resident	85 ± 3
Established Resident	76 ± 4
Income:[25]	
Under $8,000	76 ± 5
$8,000-$15,000	79 ± 4
Over $15,000	85 ± 4

Two significant demographic patterns emerged with respect to the economic development (see Table 6-3). New residents were more inclined to support the developmental activities than the established residents. Also, people in higher income brackets expressed greater support for economic development.

TABLE 6-4

RURAL CHARACTER SCALE

Area:[26]	
Roosevelt	64 ± 5
Vernal & Rangely	58 ± 3
Age:[27]	
Under 30	55 ± 5
30-44	61 ± 4
Over 44	63 ± 4
Time in Community:[28]	
New Resident	53 ± 5
Established Resident	63 ± 3
Religion:[29]	
Active Mormon	64 ± 3
Other	54 ± 4

Concern for rural community character varied significantly among several subgroups (see Table 6-4). Active Mormons and established residents were more desirous of preserving the rural atmosphere of their community than their counterparts. Roosevelt respondents displayed more interest in rural character than did respondents from Vernal and Rangely. Older people were more concerned about maintaining a rural atmosphere than younger people.

NOTES

[1]Random samples without replacement were taken in each of the three communities; however, the proportion of people interviewed differed for each town. Furthermore, the samples within each community were designed so that half of the respondents were men and half women.

[2]Estimates for the number of households were made using information from the Vernal Chamber of Commerce, Utah Industrial and Development Information System, telephone directories and Census data.

[3]Weighting factors were determined by taking the proportion of total households in a particular community and dividing by the proportion of interviews taken from that community.

[4]A sampling error of 10 percentage points at the 95% confidence level means that for an estimate such as 47% there is a 95% chance that the true population percentage will fall between 37% and 57%. (47% - 10% = 37%) (47% + 10% = 57%).

[5]Since the sample design was disproportionate, the chi square test for contingency tables is not an appropriate test for significance. Instead two other hypotheses tests were used (see Survey Sampling by Kish). For comparisons of two mean or percentage estimates, a difference-of-means tests can be found in Survey Sampling by Kish.

For comparisons of more than two percentage estimates, a test was proposed by Dr. Michael P. Windham, Assistant Professor of Mathematics at Utah State University. A discussion of the test follows:

Suppose there are n different subpopulations where n>2.

Let $H_o : \mu_i = \mu$ for all $i \leq n$ where μ_i is the mean from the i^{th} subpopulation

Let $\hat{\mu}_i$ be an unbiased estimate of the mean from the i^{th} subpopulation.

Let $\sigma^2 = \max. \ S_i^2$ where S_i^2 is an unbiased estimate of the variance of $\hat{\mu}_i$.

Assume that $\hat{\mu}_i$ is $N(\mu, \sigma^2)$.

One can consider $\hat{\mu}_1, \ldots, \hat{\mu}_n$ as independent, identically distributed random variables.

Therefore $\sum_{i=1}^{n} \dfrac{(\hat{\mu}_i - \sum_{i=1}^{n} \hat{\mu}_i/n)^2}{\sigma^2}$ is $\chi^2 (n-1)$.

H_o is rejected if the probability that the above test statistic could be at least as large as that computed is less than .05.

In reality, some of the $\hat{\mu}_i$'s would likely have variances less than σ^2. However, if this is the case, the expected contribution to the test statistic is less than under the initial assumption. Hence the test will tend to yield conservative significance estimates.

[6]Approve $\hat{\mu}_{\text{new residents}} - \hat{\mu}_{\text{established residents}} = 22 = 5.1$ S.E. $P < .01$

Disapprove $\hat{\mu}_{\text{established residents}} - \hat{\mu}_{\text{new residents}} = 11 = 3.6$ S.E. $P < .01$

[7]Oppose $\chi^2(2) = 6.3$ $P < .05$

[8]Oppose $\chi^2(2) = 7.1$ $P < .05$

[9]Favor $\hat{\mu}_{\text{new residents}} - \hat{\mu}_{\text{established residents}} = 17 = 2.5$ S.E. $P < .05$

Oppose $\hat{\mu}_{\text{established residents}} - \hat{\mu}_{\text{new residents}} = 15 = 2.4$ S.E. $P < .05$

[10]Favor $\chi^2(2) = 6.0$ $P < .05$

[11]Oppose $\hat{\mu}_{\text{non-oil worker}} - \hat{\mu}_{\text{oil worker}} = 16 = 2.4$ S.E. $P < .05$

[12]Approve $\chi^2(2) = 7.7$ $P < .05$

Disapprove $\chi^2(2) = 6.4$ $P < .05$

[13]Like $\chi^2(2) = 6.8$ $P < .05$

[14]Like $\hat{\mu}_{\text{established residents}} - \hat{\mu}_{\text{new residents}} = 14 = 2.8$ S.E. $P < .01$

[15]Like $\hat{\mu}_{\text{active Mormon}} - \hat{\mu}_{\text{other}} = 16 = 3.6$ S.E. $P < .01$

Dislike $\hat{\mu}_{\text{other}} - \hat{\mu}_{\text{active Mormon}} = 9 = 2.8$ S.E. $P < .01$

[16]Yes $\chi^2(2) = 10.3$ $P < .01$

[17]Economic Growth $\chi^2(2) = 6.4$ $P < .01$

Rural Character $\chi^2(2) = 6.1$ $P < .05$

[18]Economic Growth $\hat{\mu}_{\text{new residents}} - \hat{\mu}_{\text{established residents}} = 22 = 3.5$ S.E. $P < .0$

Rural Character $\hat{\mu}_{\text{established residents}} - \hat{\mu}_{\text{new residents}} = 15 = 2.5$ S.E. $P < .05$

[19]Economic Growth $\hat{\mu}_{\text{other}} - \hat{\mu}_{\text{active Mormon}} = 13 = 2.1$ S.E. $P < .05$

Rural Character $\hat{\mu}_{\text{active Mormon}} - \hat{\mu}_{\text{other}} = 15 = 2.6$ S.E. $P < .01$

[20]Negative $\hat{\mu}_{\text{Vernal \& Roosevelt}} - \hat{\mu}_{\text{Rangely}} = 22 = 3.3$ S.E. $P < .01$

[21]Positive $\hat{\mu}_{\text{other}} - \hat{\mu}_{\text{active Mormon}} = 14 = 2.1$ S.E. $P < .05$

[22]Positive $\hat{\mu}_{\text{oil}} - \hat{\mu}_{\text{non-oil}} = 20 = 2.4$ S.E. $P < .05$

[23]Positive $\hat{\mu}_{\text{other}} - \hat{\mu}_{\text{active Mormon}} = 21 = 3.1$ S.E. $P < .05$

[24]$\hat{\mu}_{\text{new residents}} - \hat{\mu}_{\text{established residents}} = 9 = 3.7$ S.E. $P < .01$

[25]$\chi^2(2) = 6.17$ $P < .05$

[26]$\hat{\mu}_{\text{Roosevelt}} - \hat{\mu}_{\text{Rangely \& Vernal}} = 6 = 2.2$ S.E. $P < .05$

[27] $\chi^2(2) = 6.5 \quad P < .05$

[28] $\hat{\mu}_{\text{established residents}} - \hat{\mu}_{\text{new residents}} = 10 = 3.7 \text{ S.E.} \quad P < .01$

[29] $\hat{\mu}_{\text{active Mormon}} - \hat{\mu}_{\text{other}} = 10 = 4.1 \text{ S.E.} \quad P < .01$

APPENDIX I

Instrument No._____
Interviewer_____
Area:
Vernal_____1
Roosevelt_____2
Rangely_____3

Hello, I'm _____ from Western Environmental Association. We're conducting a public opinion survey concerning the impact of oil shale development on the residents of the surrounding area. May I have five minutes of your time?

---

1. How long have you lived in your community?

less than 1 year_____1
1 - 5 years_____2
6 - 15 years_____3
16 - 30 years_____4
over 30 years_____5

2. What do you like most about your community?_____

_____

_____

3. Do you approve or disapprove of the area's expanding population and economic activities?

approve_____1
disapprove_____2
undecided_____3

4. Do you like or dislike the rural character of your community?

like_____1
dislike_____2
undecided_____3

5. Do you feel that your community can undergo economic growth and still maintain it's rural character?

yes_____1
no_____2
undecided_____3

6. If you had to choose between the following two alternatives which would you prefer: Economic growth or preserving the rural character of the community?

economic growth_____ 1
preserving rural character of community_____ 2
undecided_____ 3

7. Do you favor or oppose an increase in population in your community if it causes local taxes to rise moderately?

favor_____ 1
oppose_____ 2
undecided_____ 3

8. What do you feel are positive changes in your community in the last two to five years?_____

_____

9. What do you feel are negative changes in your community in the last two to five years?_____

_____

10. Have you heard of the White River Shale Oil Corporation?

yes_____ 1
no_____ 2

11. Do you approve or disapprove of oil shale development in the Uintah Basin?

approve_____ 1
disapprove_____ 2
undecided_____ 3

**********NEXT QUESTION IS IMPORTANT**********

12. Why?_____

_____

_____

13. How could oil shale development best be undertaken so as to have a positive effect on you and your community?_____

_____

_____

14. What is your religious preference?

Protestant_____1
Catholic_____2
Mormon (LDS)_____3
other_____4
refuse to answer_____5

15. Would you say you always, sometimes, or never attend church?

always_____1
sometimes_____2
never_____3
refuse to answer_____4

**********NEXT QUESTION FOR NON-MORMONS ONLY**********

16. What is your impression of the Mormon community in your town?_____

_____

_____

**********NEXT TWO QUESTIONS FOR VERNAL AND ROOSEVELT ONLY****

17. Do you feel large increases in the non-Mormon population would have a positive or negative influence on the educational system?

positive_____1
negative_____2
no effect_____3
undecided_____4
does not apply_____5

(IF ANSWERED "NEGATIVE" OR "POSITIVE") Would you explain your answer?_____

_____

_____

18. Do you feel large increases in the non-Mormon population would have a positive or negative influence on the character of the community?

positive_____1
negative_____2
no effect_____3
undecided_____4
does not apply_____5

(IF ANSWERED "NEGATIVE" OR "POSITIVE") Would you explain your answer?_____

_____

_____

19. In what one way do you spend most of your leisure time?_____

20. What is your age?

less than 30	1
30 - 44	2
45 - 60	3
over 60	4
refuse to answer	5

21. Taking into consideration all sources of income for you and your spouse, which category represents your total income before taxes in 1974?

under $8,000	1
$8,000 - $15,000	2
over $15,000	3
refuse to answer	4

22. Occupation of head of household:_____

23. Sex:

male	1
female	2

24. Would you be interested in participating in a follow-up to this survey?___

APPENDIX II

DO YOU APPROVE OR DISAPPROVE OF THE AREA'S EXPANDING POPULATION AND ECONOMIC ACTIVITIES?

	Approve	Disapprove	Undecided
TOTAL	79%	10%	11%
AREA:			
Rangely	82	12	6
Roosevelt	75	10	15
Vernal	81	10	9
AGE:			
Under 30	81	12	7
30-44	83	6	11
Over 45	74	13	13
TIME IN COMMUNITY:			
New Resident	94	3	3
Established Resident	72	14	14
INCOME:			
Under $8,000	68	15	17
$8,000-$15,000	82	10	8
Over $15,000	84	8	8
RELIGION:			
Active Mormon	80	8	12
Other	80	12	8
OIL/NON-OIL:			
Oil Worker	87	8	5
Non-Oil Worker	76	11	13

DO YOU FAVOR OR OPPOSE AN INCREASE IN POPULATION IN YOUR COMMUNITY IF IT CAUSES LOCAL TAXES TO RISE MODERATELY?

	Favor	Oppose	Undecided
TOTAL	55%	33%	12%
AREA:			
Rangely	61	24	15
Roosevelt	50	41	9
Vernal	56	31	13
AGE:			
Under 30	54	34	12
30-44	63	23	14
Over 45	46	44	10
TIME IN COMMUNITY:			
New Resident	66	24	10
Established Resident	49	38	13
INCOME:			
Under $8,000	43	40	17
$8,000-$15,000	54	37	9
Over $15,000	70	20	10
RELIGION:			
Active Mormon	54	35	11
Other	56	31	13
OIL/NON-OIL:			
Oil Worker	59	23	18
Non-Oil Worker	52	38	10

DO YOU APPROVE OR DISAPPROVE
OF OIL SHALE DEVELOPMENT IN THE UINTAH BASIN?

	Approve	Disapprove	Undecided
TOTAL	83%	5%	12%
AREA:			
Rangely	73	9	18
Roosevelt	89	0	11
Vernal	82	7	11
AGE:			
Under 30	83	5	12
30-44	82	2	16
Over 45	85	7	8
TIME IN COMMUNITY:			
New Resident	89	1	10
Established Resident	81	6	13
INCOME:			
Under $8,000	83	2	15
$8,000-$15,000	81	5	14
Over $15,000	91	3	6
RELIGION:			
Active Mormon	82	5	13
Other	84	5	10
OIL/NON-OIL:			
Oil Worker	78	5	17
Non-Oil Worker	85	5	10

DO YOU LIKE OR DISLIKE THE RURAL CHARACTER OF YOUR COMMUNITY?

	Like	Dislike	Undecided
TOTAL	87%	6%	7%
AREA:			
Rangely	86	8	6
Roosevelt	82	6	12
Vernal	89	6	5
AGE:			
Under 30	75	14	11
30-44	91	2	7
Over 45	92	4	4
TIME IN COMMUNITY:			
New Resident	77	9	14
Established Resident	91	5	4
INCOME:			
Under $8,000	80	12	8
$8,000-$15,000	87	5	8
Over $15,000	92	3	5
RELIGION:			
Active Mormon	94	2	4
Other	78	12	10
OIL/NON-OIL:			
Oil Worker	90	7	3
Non-Oil Worker	86	5	9

DO YOU FEEL THAT YOUR COMMUNITY CAN UNDERGO ECONOMIC GROWTH AND STILL MAINTAIN ITS RURAL CHARACTER?

	Yes	No	Undecided
TOTAL	65%	23%	12%
AREA:			
Rangely	58	29	13
Roosevelt	67	20	13
Vernal	65	24	11
AGE:			
Under 30	71	26	3
30-44	66	22	12
Over 45	58	23	19
TIME IN COMMUNITY:			
New Resident	71	22	7
Established Resident	62	24	14
INCOME:			
Under $8,000	45	32	23
$8,000-$15,000	65	25	10
Over $15,000	79	14	7
RELIGION:			
Active Mormon	69	18	13
Other	61	28	11
OIL/NON-OIL:			
Oil Worker	70	23	7
Non-Oil Worker	63	24	13

IF YOU HAD TO CHOOSE BETWEEN THE FOLLOWING TWO ALTERNATIVES, WHICH WOULD YOU PREFER?

	Economic Growth.	Rural Character.	Undecided
TOTAL	58%	31%	11%
AREA:			
Rangely	61	27	12
Roosevelt	47	41	12
Vernal	63	26	11
AGE:			
Under 30	61	30	9
30-44	60	28	12
Over 45	52	35	13
TIME IN COMMUNITY:			
New Resident	72	21	7
Established Resident	50	36	14
INCOME:			
Under $8,000	50	30	20
$8,000-$15,000	59	35	6
Over $15,000	63	23	14
RELIGION:			
Active Mormon	52	38	10
Other	65	23	12
OIL/NON-OIL:			
Oil Worker	62	24	14
Non-Oil Worker	56	34	10

DO YOU FEEL LARGE INCREASES IN THE NON-MORMON POPULATION WOULD HAVE A POSITIVE OR NEGATIVE INFLUENCE ON THE EDUCATIONAL SYSTEM?

	Positive	Negative	No Effect	Undecided
TOTAL	39%	7%	36%	18%
AREA:				
Roosevelt	37	7	41	15
Vernal	40	7	33	20
AGE:				
Under 30	39	11	36	14
30-44	47	7	31	15
Over 45	32	4	41	23
TIME IN COMMUNITY:				
New Resident	47	10	32	11
Established Resident	35	6	38	21
INCOME:				
Under $8,000	31	5	47	17
$8,000-$15,000	43	7	29	21
Over $15,000	41	5	45	9
RELIGION:				
Active Mormon	33	9	40	18
Other	47	5	32	16
OIL/NON-OIL:				
Oil Worker	54	7	29	10
Non-oil Worker	34	7	38	21

DO YOU FEEL LARGE INCREASES IN THE NON-MORMON POPULATION WOULD HAVE A POSITIVE OR NEGATIVE INFLUENCE ON THE CHARACTER OF THE COMMUNITY?

	Positive	Negative	No Effect	Undecided
TOTAL	31%	16%	30%	23%
AREA:				
Roosevelt	28	16	26	30
Vernal	32	16	33	19
AGE:				
Under 30	37	15	18	30
30-44	32	16	33	19
Over 45	24	17	37	22
TIME IN COMMUNITY:				
New Resident	30	15	35	20
Established Resident	31	16	28	25
INCOME:				
Under $8,000	29	17	35	19
$8,000-$15,000	29	17	30	24
Over $15,000	32	15	27	26
RELIGION:				
Active Mormon	21	22	32	25
Other	42	9	30	19
OIL/NON-OIL:				
Oil Worker	39	14	26	21
Non-oil Worker	28	16	32	24

IN WHAT ONE WAY DO YOU SPEND MOST OF YOUR LEISURE TIME?

	Hunting,[1] Etc.	Outdoor[2] Sports	Domestic[3] Activities	Civic[4] Work	Misc.	No Response
TOTAL	31%	18%	40%	2%	1%	8%
AREA:						
Rangely	30	23	37	3	0	7
Roosevelt	32	22	40	0	0	6
Vernal	31	15	40	3	1	10
AGE:						
Under 30	26	27	34	2	2	9
31-45	32	20	38	2	0	8
Over 45	35	8	47	2	0	9
TIME IN COMMUNITY:						
New Resident	35	23	31	4	0	7
Established Resident	39	16	44	1	1	9
INCOME:						
Under $8,000	25	11	55	0	0	9
$8,000-$15,000	34	20	38	2	1	5
Over $15,000	38	20	29	3	0	10
RELIGION:						
Active Mormon	22	20	45	3	0	10
Other	41	16	33	2	1	7
OIL/NON-OIL:						
Oil Worker	39	20	30	3	2	6
Non-oil Worker	28	18	43	2	0	9
SEX:						
Male	44	22	25	0	0	9
Female	18	14	54	4	1	8

1. Includes hunting, camping, fishing, traveling, in the mountains
2. Includes outdoor sports and recreation, boating, skiing, water-skiing, golfing, horse racing, rodeo, archery, river running, motorcycling, swimming, city sports, bowling, jogging, horseback riding
3. Includes domestic, staying home, resting, gardening, hobbies, cleaning house, reading, sewing, crocheting, knitting, cooking, T.V., sleeping, farming, eating out, visiting, writing
4. Includes civic work, church, 4-H